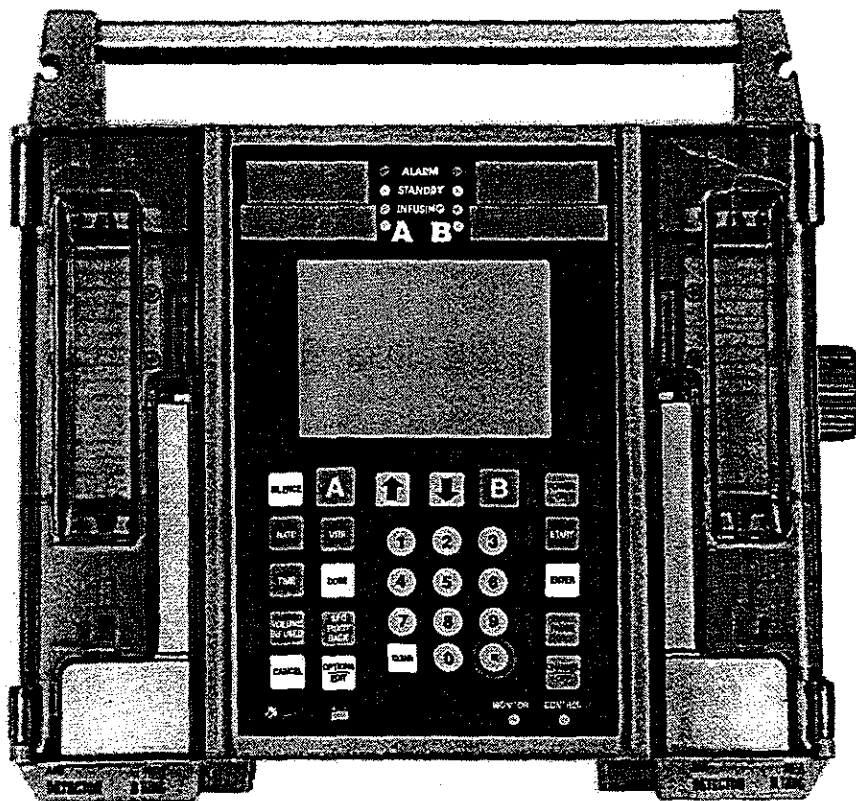


110V and 220V



imed® Gemini PC-2TX®
VOLUMETRIC INFUSION PUMP/CONTROLLER
MAINTENANCE MANUAL

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WARNINGS, CAUTIONS AND NOTICES

CAUTION: FEDERAL (USA) LAW RESTRICTS THIS DEVICE TO SALE BY OR ON THE ORDER OF A PHYSICIAN.

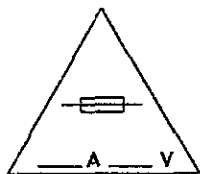
USE ONLY HOSPITAL GRADE POWER SUPPLY CORD TO INSURE PROPER GROUNDING. GROUNDING RELIABILITY CAN ONLY BE ACHIEVED BY CONNECTION TO A RECEPTACLE MARKED "HOSPITAL GRADE".

DANGER: EXPLOSION HAZARD, DO NOT USE IN THE PRESENCE OF FLAMMABLE ANESTHETICS.

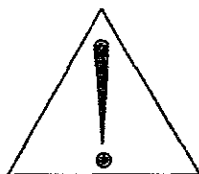
WARNING: TO PREVENT UNRESTRICTED FLOW, CLOSE CLAMP WHEN FLO-STOP IS OPEN.



CAUTION: TO REDUCE RISK OF ELECTRICAL SHOCK, DO NOT REMOVE COVER OR BACK. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.



WARNING: REPLACE FUSE AS MARKED.



CAUTION: BEFORE CONNECTING "REFER TO MANUAL"

NOTE

TO MAXIMIZE THE SERVICE LIFE OF THE INSTALLED BATTERY, IT IS RECOMMENDED THAT THIS INSTRUMENT BE STORED AND OPERATED IN AN ENVIRONMENT THAT IS TEMPERATURE CONTROLLED BETWEEN 68°F (20°C) AND 77°F (25°C).

WARNING

IN THE EVENT THE INSTRUMENT IS DROPPED AT ANY TIME, IT MUST BE CHECKED BY A BIOMEDICAL TECHNICIAN PRIOR TO USE FOR PATIENT CARE.

WARNINGS, CAUTIONS AND NOTICES

220V

WARNING: TO PREVENT UNRESTRICTED FLOW, CLOSE ROLLER CLAMP WHEN FLO-STOP® IS OPEN.



CAUTION: REFER TO MANUAL



CLASS 1

TYPE CF (Equipment useable for direct cardiac applications)



ALTERNATING CURRENT



REPLACE FUSE ONLY WITH SAME TYPE AND RATING



EQUIPOTENTIAL GROUND POINT: IF THE INTEGRITY OF THE EQUIPOTENTIAL EARTH CONNECTION OR HOSPITAL EARTH SYSTEM IS IN QUESTION, OPERATE THE INSTRUMENT USING INTERNAL BATTERY POWER.

IPX1

DRIP PROOF

CAUTION

ONLY equipment that has been qualified to IEC 601-1 standards should be connected to the PC-2TX's RS-232-C Data Port and the connection should ONLY be performed by qualified personnel.

CAUTION

Only systems that have been qualified to IEC 601-1 standards should be connected to the PC-2TX's Nurse Call connector and the connection should ONLY be performed by qualified personnel.

NOTICE

Product design and/or specifications are subject to change without notice. The information contained in this manual is current as of the date of issue.

This publication contains ALARIS Medical Systems™ proprietary data provided solely for the use of technical personnel in repairing IMED® Gemini infusion pump/controllers.

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U.S. Patents 4,617,014; 4,689,043; 4,690,673; 4,725,205; 4,728,265; 4,836,752; 4,909,710; 4,920,336; 4,954,046; 4,859,927; 4,764,166; 305,151. AU 580,184; 586,594; 590,179; 601,664; 607,112; 622,088; 596,552; 604,477. CA 1,235,033; 1,258,212; 1,300,977; 1,280,647; 1,296,791; 2,020,926; 1,296,092; 1,238,832. AT 0,225,158. BE 0,225,158. FR 0,225,158; 283,614; 315,312; 0,431,726; 0,238,227. GB 0,225,158; 283,614; 315,312; 0,431,726; 0,238,227. NL 0,225,158; 283,614. IT 0,225,158; 283,614. SE 0,225,158; 283,614. CH 0,225,158. DE P3686558.3; P3772,556.9; 3871721T2; P6908208; P3774598. TW UM52721. JP 特許第 1 7 5 4 4 7 0 号; 特許第 1 8 1 6 8 7 2 号; 特許第 1 9 0 2 3 8 7 号; 特許第 1 9 6 7 1 6 8 号; 特許第 1 7 9 3 1 1 9 号; 特許第 1 7 3 0 3 9 5 号.

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PREFACE

This manual contains operation and maintenance instructions for the IMED® GEMINI PC-2TX® series of Volumetric Infusion Pumps/Controllers ("PC-2TX"). The information provided herein is intended for use by technical personnel responsible for servicing these products. The material is divided into seven sections and is presented as follows: Section 1 - Description; Section 2 - Preparation for Use; Section 3 - Operation; Section 4 - Principles of Operation; Section 5 - Maintenance; Section 6 - Illustrated Parts Breakdown; Section 7 - Calibration and Preventative Maintenance.

Additional copies of this manual may be obtained by contacting your nearest ALARIS Medical Customer Service Department.

This manual P/N 143648 supersedes PC-2TX Maintenance Manual, Part No. 1325-9201-00, 1325-9208-00, and 141881.

The features of the 220V model of the PC-2TX have been incorporated into this manual. Text or graphics that are related exclusively to the 220V model are identified with a **220V** symbol.

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WARRANTY

SALES AND SERVICE OFFICES

TECHNICAL SERVICE MANUAL SUPPLEMENTS

PC-2TX

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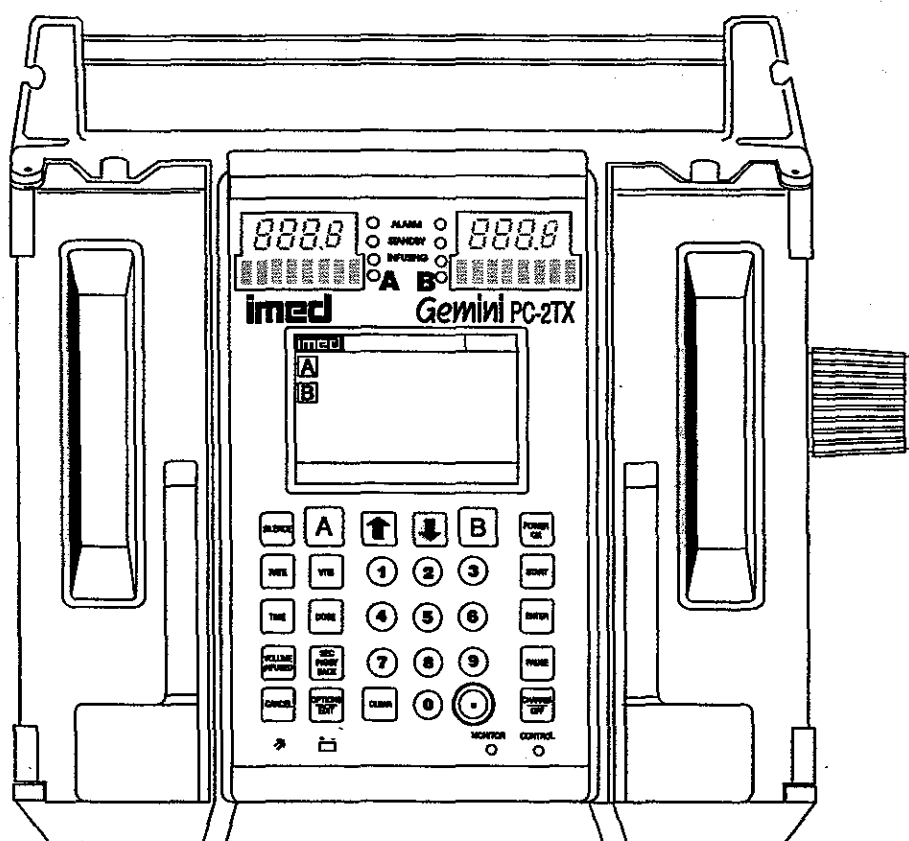


Figure 1-1. IMED® GEMINI PC-2TX® Volumetric Infusion Pump/Controller

SECTION 1 - DESCRIPTION

1.1 INTRODUCTION

This section includes general operating characteristics, physical description and operating specifications for all versions of the IMED® GEMINI PC-2TX® Volumetric Infusion Pump/Controller ("PC-2TX").

1.2 OPERATING CHARACTERISTICS

The GEMINI Model PC-2TX is a two channel volumetric infusion pump/controller used in the administration of intravascular drugs and fluids. Both channels are capable of independent operation in either the Pump or Controller delivery mode. The pumping mechanism employs linear peristaltic action. The peristaltic action is provided by a series of 12 cam-actuated fingers that sequentially collapse then release, in a ripple-like action, the soft pumping segment of a GEMINI administration set. This action produces a positive pressure at the outlet side and a vacuum on the inlet side of the pump, thereby delivering a continuous flow of infusion solutions reliably, accurately and with a high degree of safety.

The two channel configuration enables a variety of infusion techniques including independent primary, simultaneous primary and sequential secondary. Independent and simultaneous primary infusions can deliver either a specified volume or the entire contents ("ALL") of a solution container. Use of the ALL setting requires installation and connection of an Empty Container Detector (ECD) which is available as an optional accessory. Sequential secondary (piggyback) infusions with independently defined delivery parameters, for both the primary and secondary solutions, can be provided on each channel.

Operational control of the PC-2TX is affected through the control and indicator panel on the front of the instrument and the Audio Control switch on the rear of the instrument. Basic operating instructions are printed on the right side of the instrument case. Functional control is provided by a 16 bit micro-processor with a stored program that includes a Maintenance mode to monitor instrument

performance, an audio/visual alarm subsystem to alert operators to abnormal conditions and redundancy checks to confirm system accuracy.

1.3 OPERATING CONDITIONS

The PC-2TX can be operated independently (Normal Operation) or as a computer controlled device (Computer Operation). Normal operation includes the Controller and Pump modes plus a Maintenance mode. Computer operation includes Monitor and Computer Control modes.

NORMAL OPERATION

SYSTEM OPTIONS

The systems option mode allows the operator to:

- Adjust contrast of the LCD display
- Set the Time of Day clock
- Enable Anesthesia Mode
- Set up Computer Control
- Check System Configuration

The System Configuration screen displays the current status of the following selectable features:

NOTES

To enter the Configuration Setup mode: press and hold the "OPTIONS/EDIT" switch at power up.

Bold face type indicates factory default settings.

- Clock Setup: **Military** or AM/PM
- Factory Set: Factory default settings **YES** or NO
- Maximum Rate: Max usable rate 1-999 mL/hr
- C2 Port: Baud 300, 600, 1200, 2400, 4800, **9600**, 19200; (Data Frame is set to N81); Serial No. XXXX.
- Aux Port: No Port
- PCS Mode: **P** or C or S Channel delivery mode selection plus mode lock/unlock

PC-2TX

- Delayed Start: **Enabled** or Disabled
- Drug Calc: **Enabled** or Disabled
- Multidose: **Enabled** or Disabled
- Dose Display: **Fixed** or Temp
- Battery Mode: Disabled Normal **High**
- Key Audio: **Enabled** or Disabled
- Alarm Audio: **Profile 1, 2 or 3**
- Switch(over) Audio: **Enabled** or Disabled
- Tamper Mode: Enabled or **Disabled**
- Language: **English**
- Anesth. Mode: Enabled or **Disabled**
- Comp. Ctrl.: **Enabled** or Disabled
- Dynamic Press: **Enabled** or Disabled
- Press. Trend: **Enabled** or Disabled
- Vol. Time Inf: **Enabled** or Disabled
- S/W Version: SCX.XX.XX.X
- MC Version: X.XX
- C2S/N: XXXX
- CRC: XXXX/Checksum: XXXX

CONTROLLER MODE

In the CONTROLLER mode, the PC-2TX is programmed to control the infusion of a specific volume of IV solution. The instrument senses and responds to patient-side pressure and container height in a manner similar to a gravity infusion. The instrument's pressure sensor measures the hydrostatic pressure from the bottle and compares that pressure against distal tubing in-line pressure. When in-line pressure exceeds pump input pressure, an occlusion condition exists and an alarm is initiated. Actual delivery pressure is directly proportional to container height; increasing container height raises and decreasing the height reduces occlusion pressure. Controller mode occlusion pressure tolerance is ± 12 (30.5cm) inches from the bottle height. Transient surges in patient-side pressure of <60 seconds duration will produce a LOW FLOW condition which stops the infusion while the pressure is above the occlusion threshold. Pressure transients above the occlusion threshold >60 seconds duration or cumulative time required to compensate for volumetric deficiency caused by periods of Low Flow in excess of 30 minutes will cause an occlusion alarm.

PUMP MODE

In the PUMP mode of operation, the instrument employs a preset occlusion pressure limit of 10 ± 2 psi (69 ± 14 kPa) predicated on a nominal container height of 24 inches (61 cm) and a delivery rate >30 mL/hr. For delivery rates <30 mL/hr, the occlusion

pressure is rate dependent to ensure timely detection of occlusion conditions. Any transient distal in-line pressure above this limit will generate a patient-side occlusion alarm.

Software Releases through 3.9.9.4

The PC-2TX, when operating in the Pump Mode, can be locked into a rate-independent (10 psi) occlusion pressure mode. This mode will result in significantly increased time-to-occlusion for rates <30 mL/hr.

Software Release 4.10.14.0 and Subsequent

A Selectable (S) pressure mode allows an occlusion pressure to be selected between 0.5 psi (25 mmHg) and 10 psi (517 mmHg) in 25 mmHg increments. A high occlusion pressure selection coupled with a slow infusion rate will result in an increase in time-to-occlusion.

MAINTENANCE MODE

The maintenance mode is intended solely for use by biomedical technicians to perform servicing and maintenance actions and **must never be used when the PC-2TX is connected to a patient**. The maintenance mode provides biomedical service personnel access to the closed loop maintenance test routines and operating history logs.

Maintenance mode menu includes:

- S/C board test and displays
- M/C board test and displays
- Press [off] to exit

The S/C board test and display sub-menu includes an Error Log display with a 100 entry register.

COMPUTER OPERATION

MONITOR MODE

The Monitor mode allows a host computer to monitor infusion status and instrument performance. Monitor mode is enabled when a host computer is connected to the PC-2TX through the Communications Data Port and the Monitor indicator is illuminated.

COMPUTER CONTROL

The Computer Control mode allows an infusion, once set up, to be controlled and monitored by a host computer installation.

1.4 USER INTERFACE

Instrument control and operation is accomplished through the 30 keypad controls, the central information display and the independent channel information displays. Infusion parameters are programmed into the instrument using the appropriate keypad controls. Rate and Volume-to-be-Infused (VTBI) are input separately for each channel. Rate and VTBI for secondary infusions (piggyback) are also programmable, independent of the primary infusion parameters, for each channel. Visual Prompt and Advisory messages with accompanying audio alerts are provided to assist operators in setting up the instrument for operation. Infusion completions, alarm conditions and software-detected malfunctions are signaled by both audio and visual alerts; hardware-detected malfunctions are signaled by an audio warning. Delayed Start, Multidosing and Drug Calculation infusions, when these features are enabled, are programmed via the Channel Options menu.

The rear panel of the PC-2TX is configured with an ECD connection for each channel, a connector to accept a Nurse Call line, and a standard RS-232-C communications data port for interfacing with a host computer.

IMED® GEMINI Series disposable administration sets are required for use with the GEMINI family of Infusion Pump/Controllers.

1.5 PHYSICAL DESCRIPTION

The PC-2TX instrument has the following physical characteristics:

| | |
|---------|--|
| Height: | 10.8 inches (27.4 cm) |
| Width: | 11.8 inches (30.0 cm) with pole clamp |
| Depth: | 7.3 inches (18.5 cm) with pole clamp |
| Weight: | ≈18 pounds (8.2 kg) including power cord |

The PC-2TX instrument consists of two major assemblies: the front and rear cases.

FRONT CASE

The front case consists of a metalized, high-impact, injection molded, plastic case/insert which houses and supports: the pumping chamber access doors, the peristaltic pumping mechanisms, pressure transducers (strain beams), Air-in-line, Slide clamp

and Flo-Stop detectors, keypad, the channel and central displays, the display CCA, logic CCA and motor control CCA.

REAR CASE

The rear case assembly consists of a die-cast aluminum shell which mounts and supports internally: the battery, transformer harness assembly, audio oscillator, power supply CCA and communication harness assembly. The exterior of the rear case supports the pole clamp, power entry module, ECD storage, power cord retention strap, power cord retention bracket and the equipotential grounding point on the 220V model.

1.6 PRODUCT HISTORY

The initial release of the GEMINI PC-2TX® Infusion Pump/Controller was in April 1994. Since that time a number of changes have occurred. Refer to Table 1-1 for product history.

1.7 OPERATING SPECIFICATIONS

The PC-2TX Operating Specifications are subordinated into Operating Requirements and Performance Specifications which are delineated in Tables 1-2 and 1-3 respectively.

1.8 ACCESSORIES

The accessories approved for use with the PC-2TX are listed in Table 1-4.

PC-2TX

Table 1-1. Product History

| Model | History |
|-------|---|
| 1325A | <ul style="list-style-type: none"> Initial release of product Software version 3.9.9.4. ADDED TX Feature set - Volume/time dosing, Selectable output pressure, Dynamic Pressure Readout, Pressure Trending (History), 7 segment display checking added with Software version 4.10.14.0. |
| 1325B | <ul style="list-style-type: none"> Rate display test enabled, Audio Failure "Pop-up box", added with Software version 5.10.18.4. |
| 1325C | <ul style="list-style-type: none"> Incorporated Corrective Drug Application with Software version 7.05.05.0. |
| 1325D | <ul style="list-style-type: none"> Software versions 7.05.05.0 and earlier, will not recognize a year entry beyond 1999 in the Clock Entry menu. Introduced Software version 1.85. |

The current PC-2TX System Configuration may be viewed by pressing Options/Edit key to bring up the Systems Options Menu, then pressing #5 Keypress, to access the System Configuration listing.

Revision Matrix:

| Revision # | PC-2TX 3.9.9.4, 4.2.8.0, 4.5.24.0, 4.10.14.0, 4.12.9.0, 5.1.18.0, 5.2.4.0 | PC-2TX 5.10.18.4 | PC-2TX 7.05.05.0 | PC-2TX 1.85 | PC-2TX 1.86 |
|---------------|---|---------------------|---------------------|----------------|----------------|
| 1325A | X | | | | |
| 1325B | | X | | | |
| 1325BX (220V) | | X | | | |
| 1325C | | | X | | |
| 1325CX (220V) | | | X | | |
| 1325D | | | | X | |
| 1326AX (220V) | | X | X | | |
| 1326BX (220V) | | | | | X |

Revision "A" - Initial Revision

Revision "B" - Software Upgrade for Units to enhance operation.

Revision "C" - Software Upgrade to correct a specific drug calculation concentration for the drug Esmolol (Brevibloc), to be incorrectly displayed.

Revision "D" - Mandatory Upgrade to incorporate with Software Revision 1.85, or 1.86.

Note¹: 1325/1326x = a number associated with a particular model, and software version, i.e., 1325A could be 3.9.9.4 or 5.10.18.4 etc.

Note²: All PC-2TX's have a Maintenance or Diagnostic Mode. To access this mode: hold in the Audio Control switch on the panel and then press Power On.keypress.

CAUTION: The "Fractional" and "Integer" Pumping Mechanisms are not interchangeable.

Table 1-2. Operating Requirements

| Parameter | Specification |
|---|--|
| Power Required: | 110V: 90-132 VAC, current draw 0.1 Amps nominal (.36 Amps max), 10 Watts, fused at 0.4 A, 50-60 Hz, 3 wire, Single ϕ 220V: 220-240 VAC, 0.15 Amps nominal, fused at 200mA, 50/60 Hz, 3 wire, Single ϕ |
| Rated Input Power: | 220V 10 VA |
| Electrical Leakage: | Less than 100 microamps |
| Electrical Shock Protection: | Class 2, Internally powered equipment |
| Level of Protection against Electrical Shock: | Type CF equipment |
| Level of Protection against fluid ingress: | IPX1 |
| Battery: | Sealed lead-acid, 6 VDC, 12 Amp-Hr |
| Battery Recharge: Instrument Off or Operating: | New batteries will recharge to 90% of capacity in 8 hours and will return to a fully charged condition within 16 hours. For maximum battery life, battery should be fully recharged after each discharge. |
| Nurse Call System Power Limitations: | Maximum recommended Voltage/Current 24 VDC/500 mA |
| Operating Temperature Range: | 40°F (5°C) to 104°F (40°C) |
| Operating Humidity Range: | 0% to 95% Relative Humidity, non-condensing |
| Storage Temperature: | -40°F (-40°C) to 158°F (70° C) |
| Storage Humidity: | 0% to 95% Relative Humidity, non-condensing at 35°C |

Table 1-3. Performance Specifications

| Parameter | Specification |
|----------------------|--------------------|
| Operating Principle: | Linear Peristaltic |
| Mode of Operation: | Continuous |

PC-2TX

Operating Range:

Pump and Controller modes:

Rate:

0.1 - 999 mL/hr in 0.1 mL/hr increments to 99.9 mL/hr and 1 mL/hr increments from 1 to 999 mL/hr

(Controller mode maximum recommended rate is 500 mL/hr)

Volume-to-be-Infused (VTBI):

0.1 - 9999 mL in 0.1 mL increments to 999.9 mL and 1 mL increments from 1 to 9999 mL.

NOTE

Fractional VTBI values cannot be used with rate values ≥ 100 mL/hr.

Keep Vein Open (KVO) Rate:

1 mL/hr for delivery rates ≥ 1 mL/hr, or set delivery rate if < 1.0 mL/hr

Occlusion Pressure -

Controller Mode:

container height ($\pm 12"$ or ± 30.5 cm)

Pump Mode:

10 \pm 2 psi (69 \pm 14 kPa) (at delivery Rates below 30 mL/hr occlusion pressure is flow rate dependent to ensure rapid response to occlusion conditions). The "10 psi mode" can be invoked during SYSTEM CONFIGURATION thereby setting occlusion pressure to 10 \pm 2 psi (69 \pm kPa) for all rates. (NOTE: Time to occlusion at rates < 30 mL/hr will be significantly increased).

Selectable Mode:

25-517 mmHg (0.5-10.0 psi) in 25 mmHg (0.5 psi) increments.

Air-In-Line Detection:

Ultrasonic

Secondary (Piggyback):

Dual rate programmable

Nurse Call Feature:

Activates an externally powered system in the event of an Alarm, Malfunction or selected Advisories

Communications Data Port:

EIA Standard RS-232-C. Requires standard 9 pin subminiature D connector

Channel Display Indicators:

ALARM:

Red LED - flashes during alarm condition

STANDBY:

Amber LED - illuminates when channel is programmed for a delayed start and awaiting start time

INFUSING:

Green LED - flashes when channel is actively infusing

Battery Operation:

With a new, fully charged battery, approximately 7.5 hours with two channels operating at 125 mL/hr. Minimum recommended run time is 4 hours.

NOTES

To maximize battery life, recharge battery for 10 hours between consecutive battery operations.

Failure to fully recharge the battery between consecutive battery operations will reduce battery life.

Audio Characteristics:







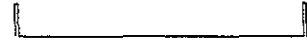
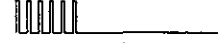

| AUDIO TYPE | AUDIO PERIOD | VOLUME VAR/FIXED | SILENCE YES/NO |
|-----------------|--|-----------------------|-------------------|
| (1) MALFUNCTION |  600 msec ON, 0.5 sec OFF, 600 msec ON, 3 sec OFF... | MAXIMUM 75db FIXED | NO |
| (2) KEY CLICK |  30 msec ON (Once) | VARIABLE | NO |
| (3) ALARM | <div> Profile 1  500 msec ON, 1500 msec OFF, 500 msec ON, 1500 msec OFF... </div> <div> Profile 2  400 msec ON, 1 sec OFF, 100 msec ON, 100 msec OFF... </div> <div> Profile 3  400 msec ON, 500 msec OFF, 400 msec ON, 500 msec OFF... </div> | VARIABLE | YES |
| (4) PROMPT |  100 msec ON, 2 sec OFF... | VARIABLE | YES |
| (5) ADVISORY |  100 msec ON, 15 sec OFF... | VARIABLE | YES |
| (6) CHANGEOVER |  100 msec ON, 400 msec OFF (6 beeps) | VARIABLE | YES |
| (7) ILLEGAL KEY |  100 msec ON, 100 msec OFF (2 beeps) | VARIABLE | NO |

Figure 1-2. Audio Characteristics

Table 1-4. Accessories

| Part No. | Description |
|-----------|--|
| 1303 | Communications Emulator Plug (optional) |
| 3299-100 | Calibrated Tubing (optional) |
| 1308 | Universal Empty Container Detector (ECD) |
| 20-2370-7 | Syringe Holder |

SECTION 2 - PREPARATION FOR USE

2.1 INTRODUCTION

This procedure contains information relative to the initial inspection and pre-operational checkout of the IMED® GEMINI PC-2TX® Volumetric Infusion Pump/Controller ("PC-2TX"). These procedures include a mechanical inspection, electrical inspection, pre-operational battery charge and a performance check to ensure that the instrument operates properly and has not been damaged during shipment or storage.

2.2 PRE-OPERATIONAL MECHANICAL INSPECTION

The PC-2TX has undergone thorough production control and quality assurance testing prior to shipment from the factory. The shipping container has been designed to protect the instrument against damage under normal shipping conditions; nevertheless, internal physical and/or electronic component damage could have occurred without leaving a visible signature. Therefore, it is recommended that the following inspection procedure be performed upon receipt of the instrument at the user's facility.

1. Carefully remove the PC-2TX from the shipping container. (Save the shipping material for reuse in the event the instrument must be returned to the factory for service or repair).
2. Inspect the exterior case, front and rear, for holes, cracks, scratches, spalling, broken or damaged controls, missing components and/or screws.
3. Inspect the green tinted windows covering the channel information displays and the screen covering the LCD for scratches or cracks.
4. Ensure the pumping chamber access doors fit flush with the case at the top, bottom, and sides.
5. Check the door handle/cam locks for ease of operation and flush fit with door when latched.

6. Inspect the pumping mechanism seals for damage and to ensure they are properly attached to the front case.
7. Inspect the Air-in-line sensors and Flo-Stop® recesses for damage or obstructions.
8. Install an approved IMED GEMINI administration set to ensure the Flo-Stop® assembly seats correctly and the door closes and latches properly.
9. Inspect the power cord for damage, bent prongs or deformed connector.
10. Exercise the pole clamp mechanism to ensure freedom of movement.
11. Check the Equipotential grounding point for damage and security. **220V**

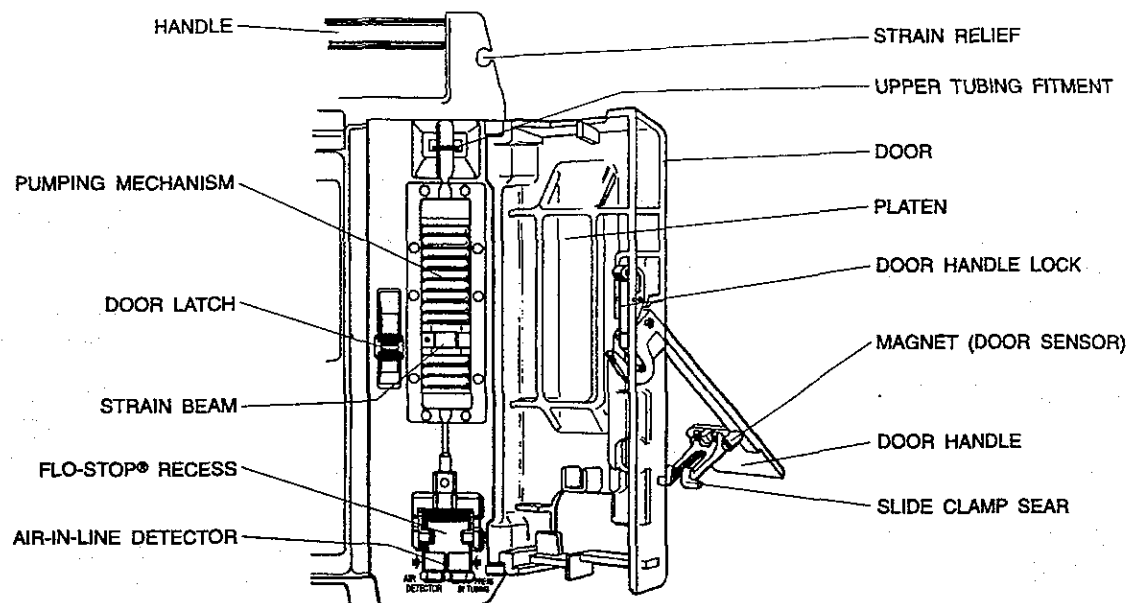
NOTE

In the event the PC-2TX shows evidence of shipping damage, notify the carrier's agent immediately. Do not return a damaged instrument to the factory before the carrier's agent has authorized repairs. Contact ALARIS Medical for authorization to return the instrument for repair regardless of liability for repair costs.

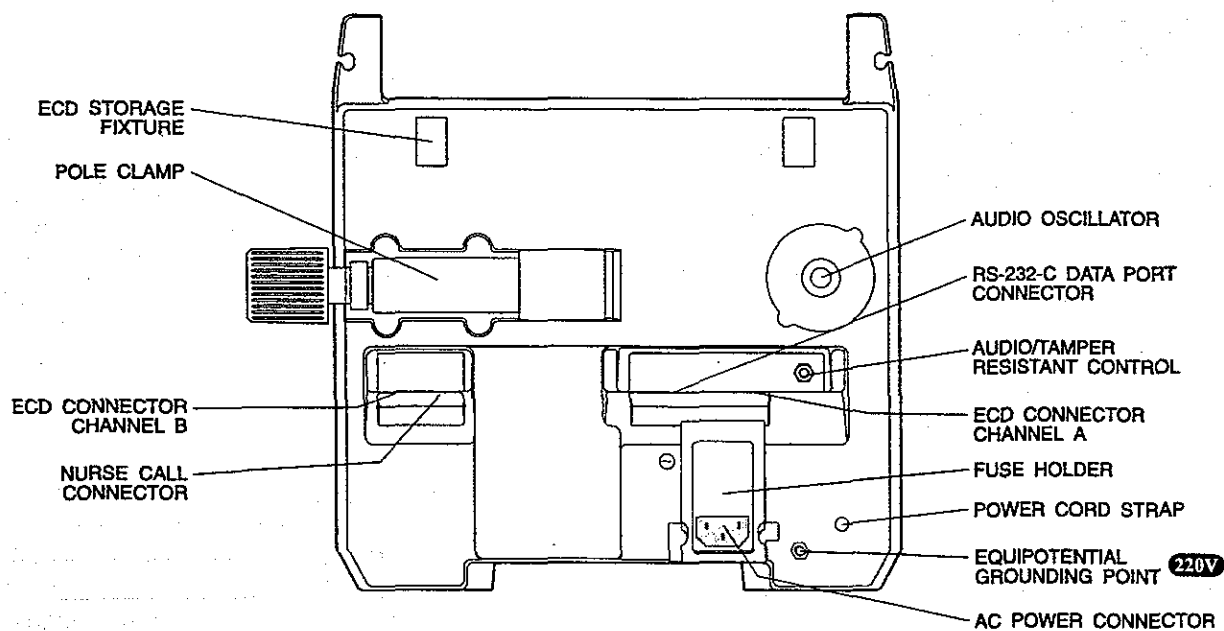
2.3 OPERATIONAL PERFORMANCE CHECK

Prior to the first operational use and following any routine maintenance or servicing of the PC-2TX, it is strongly recommended that an abbreviated operational performance check be performed. The operational performance check consists of two phases; a Pre-operational Electrical Inspection to check the electrical integrity of the instrument for compliance with regulatory agency requirements and an operational performance test to verify pump/controller performance.

PC-2TX



FRONT



REAR

Figure 2-1. PC-2TX Front and Rear Panel Operating Features

2.3.1 Pre-operational Check Battery Charge

The batteries are in a fully charged condition upon completion of the post manufacturing quality assurance inspection. However, since considerable time could elapse between manufacture and first use, a pre-operational battery charge is recommended. Connect the AC power cord to a suitable AC outlet and allow the battery to charge for 24 hours.

2.3.2 Pre-operational Electrical Inspection

The pre-operational electrical inspection includes an electrical leakage test and a ground continuity check.

CAUTION

Some of these tests are inherently hazardous. Safeguards for personnel and property should be employed when conducting such tests. Tests should only be performed by qualified personnel.

2.3.2.1 Electrical Leakage Test

Perform an electrical leakage current measurement in compliance with Underwriters Laboratories (UL) 544 for Patient Care Equipment and/or Canadian Standards Association (CSA) Standard C22.2 No. 125 for Risk Class 2G Equipment or IEC 601-1. Leakage currents are to be less than 100 microamperes.

2.3.2.2 Electrical Ground Test

Perform an electrical ground impedance measurement in compliance with UL 544 for Patient Care Equipment and/or CSA Standard C22.2 No. 125 for Risk Class 2G Equipment or IEC 601-1. The impedance between the grounding pin on the power cord plug and the grounding point on the rear case should not exceed 100 milliohms.

2.3.3 Abbreviated Operational Performance Test

The following operational performance test is designed to ensure that the PC-2TX's controls and indicators are functioning properly and all pumping mechanisms are in working order.

2.3.3.1 Test Requirements

The following items of laboratory equipment and supplies are required to conduct the operational performance tests:


1. Two (2) IMED GEMINI administrative sets (Reorder # 2210) with upper injection sites.
2. Two (2) IV Solution Containers.
3. Standard IV Pole.
4. 10 mL burette.
5. Open-ended Air-in-line simulator (see Figure 2-2).
6. Digital Pressure gauge, 0-60 psig with stopcock.
7. Safety Analyzer - Dynatech-Nevada Model 231D or equivalent.
8. Air-in-line simulator (see Figure 2-2).

2.3.3.2 Test Procedures

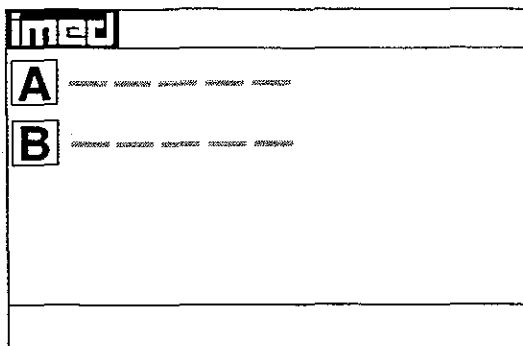
The following tests and associated procedures are presented in a sequence that provides an efficient, qualitative check of instrument operability.

INITIAL SETUP

PC-2TX keypad control locations are shown in Figure 3-1 and are functionally described in Table 3-1.

1. Mount pump on IV pole (leave AC power cord unplugged).
2. Fill IV fluid containers with water and hang on IV pole 24" (61cm) above PC-2TX.
3. Spike and prime administration sets.
4. Press POWER ON Control and check:
 - Verify all LEDs illuminate then extinguish
 - Ensure all segments of the channel rate displays illuminate
 - Ensure the channel information displays show  then extinguish
 - A single audio prompt sounds
 - The channel A rate display shows "- - - -"
 - Check the Central display for the IMED logo pattern, followed by the setup screen shown below:

PC-2TX



7. Press **OPTIONS EDIT** to select the Systems Options menu, then press **5** to select System Configuration.
8. Use the **↑** **↓** controls to toggle through the system configuration display to determine options available and the status of each option.
9. Press **CANCEL** twice to return to the Setup screen shown above.

CHARGING INDICATION

1. Connect AC Power cord to a 120 VAC or 220V power source, as appropriate, and check:
 - AC Power Indicator - Illuminates.
2. Unplug AC Power cord from the AC power source and check:
 - AC Power Indicator - extinguishes.
3. Press **POWER ON**; following instrument initialization:
 - Battery Operation Indicator - flashes.
4. Reconnect AC Power cord to the the instrument.
 - AC Power indicator - illuminates
 - Battery Operation indicator - extinguishes.

PUMP MODE TEST

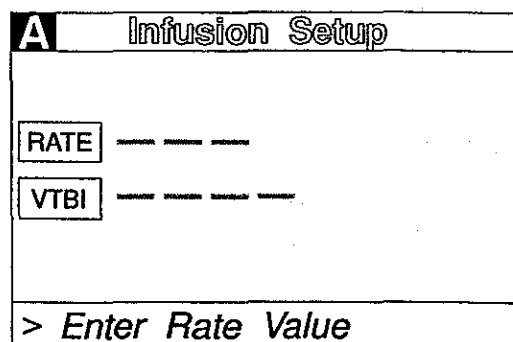
NOTE

The following procedures are described for channel A and are applicable to both PC-2TX channels.

1. Open the channel A access door and check:
 - The pumping mechanism "homes", i.e.

pump mechanism rotates to a position where the #11 finger is fully extended.

2. Install a prepared GEMINI set in channel A and close the door. Ensure the fluid level in the container is 24" (61 cm) above the height of the strain beam.
3. Connect the distal end of the tubing set to the 10 mL burette.
4. Press **A** and check the Infusion Setup screen:



- Press **OPTIONS EDIT**, followed by **4** then use **↑** **↓** controls to select Pump mode
 - Press **ENTER** to confirm selection
 - Press **CANCEL** to exit channel options
 - Press **RATE**, then use the numeric data entry controls to input a rate parameter of 125 mL/hr
 - Press **VTBI**, then use the numeric data entry controls to input a VTBI parameter of 5 mL
 - Press **VOLUME INFUSED**, while the volume infused presentation is displaying, press **CLEAR** to "0" the channel A primary, secondary and total volume infused.
5. Record the fluid level in the burette (there must be sufficient capacity in the burette to accept 5 mL of fluid).
 6. Press **START** and observe:
 - "125" displays in the Channel Information rate display
 - INFUSING indicator - flashes
 - "5 mL" displays for channel A in the Central Information display.

7. When audio alert sounds and "INFUSION COMPLETE-KVO" scrolls, immediately press **A** followed by **PAUSE** and check:
 - Rate display shows "1"
 - "STANDBY" indicator - flashes
 - "INFUSING" indicator - extinguishes
 - VTBI value in Central display shows "0 mL".
8. Press **VOLUME INFUSED** and check:
 - PRI volume infused shows 5.0.
9. Record the fluid level in the burette; then compare that value from the initial reading in step 5. The difference should be between 4.75 and 5.25 mL.
10. Repeat steps 1 through 9 for channel B.

OUTPUT PRESSURE TEST

1. Connect the distal end of the tubing set to the pressure gauge.
2. Reset the channel A VTBI to 25 mL.
3. Press **START** and observe:
 - Pumping mechanism stops
 - Audio Alarm sounds
 - ALARM indicator - flashes
 - "OCCLUDED-PATIENT SIDE" scrolls continuously.
 - Central Information displays shows ALARM for channel A
4. Record pressure gauge reading on the data sheet immediately following alarm (reading must be between 8 and 12 psi or 414 and 620 mmHg).
5. Press **SILENCE** to silence the audio, then press **A** followed by **PAUSE**.
6. Turn the stopcock on the pressure gauge to relieve the pressure.
7. Repeat steps 1 through 6 for channel B.
8. When both channels have been tested, press **A** or **B** as appropriate, then **CHANNEL OFF** to power down the channel.

MAXIMUM PRESSURE TEST

1. Initialize instrument in the Maintenance Mode.
2. Press **2** to select M/C Board Tests and Displays.
3. Press **1** to select maximum pressure test.
4. Press **A** to select channel A.
5. Press **START** and allow the pump to operate for at least 30 seconds and wait until the peak pressure stabilizes.
6. Record the highest pressure reading obtained. **Resultant pressure must be ≥ 17 psi (879 mmHg).**
7. Press **CANCEL** twice to return to the Maintenance Mode screen.
8. Turn stopcock on the pressure gauge to relieve the pressure.
9. Press **CANCEL** twice, then **3** to power down the instrument.

AIR IN LINE TEST

1. Open the channel A access door and remove the administration set.
2. Install the pumping segment of the AIL simulator into the channel A pumping mechanism, then press the tubing into the AIL detector.
3. Push the slide clamp in (the instrument will auto power on in Alarm mode).
4. Use the AIL simulator plunger to raise the fluid level to the top of the slide clamp fitment.
5. Close the door.
6. Select the channel to be tested, set the rate to 125 mL/hr and VTBI to 50 mL and press **START**.
7. Use the AIL simulator plunger to draw the fluid level below the AIL detector.

PC-2TX

8. Verify that within 2 seconds the PC-2TX goes into AIL alarm:

- Pumping stops
- Operating LED indicator stops flashing
- Alarm audio sounds
- Alarm LED flashes
- Channel Information display scrolls "AIR IN LINE"
- Central Information display shows "ALARM" for appropriate channel.

9. Select the test channel and press **CHANNEL OFF** to power down or **PAUSE** to set up the other channel for test.

If further quantitative testing is required to comply with hospital protocol for acceptance/qualification of new equipment, refer to the Comprehensive Operational Test Procedures described in Section 5 of this manual.

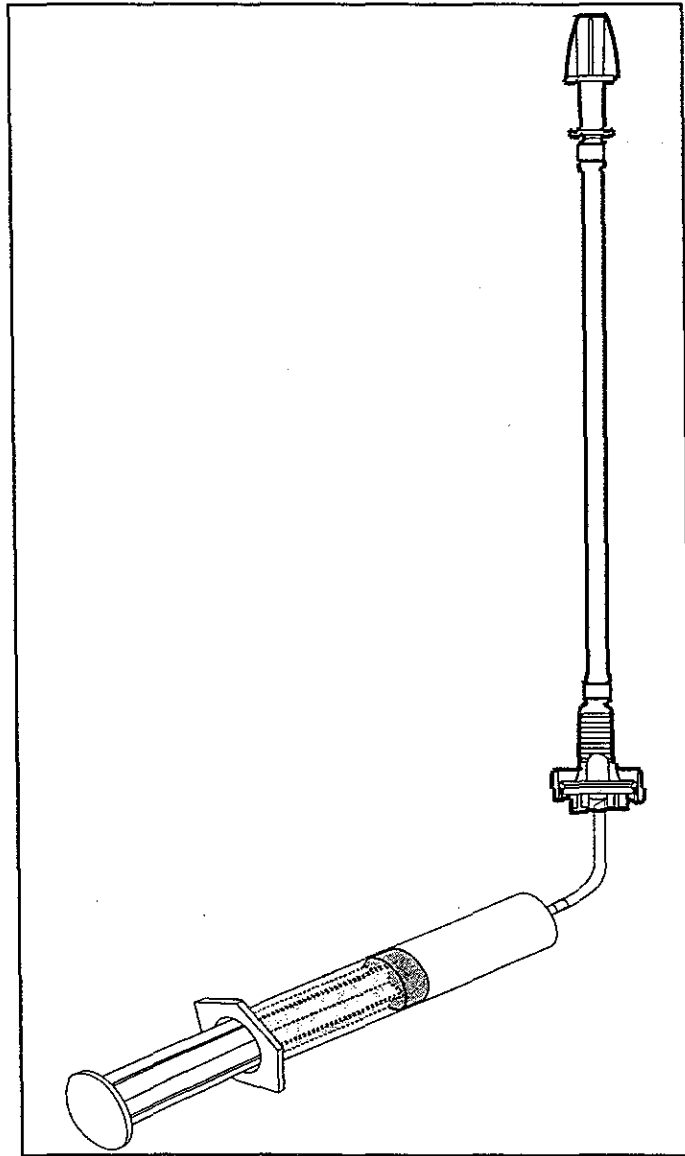


Figure 2-2. Air-In-Line Simulator

PC-2TX

PC-2TX TEST DATA SHEET

Instrument Serial No. _____ Software Version _____

Date _____ Technician _____

| Test No. | Description | Reference | Record Result | Pass/Fail |
|----------|--------------------------------|-----------|----------------------------------|--|
| 1 | Electrical Leakage Test | 2.3.2.1 | _____ | Pass____/Fail____ |
| 2 | Electrical Ground Test | 2.3.2.2 | _____ | Pass____/Fail____ |
| 3 | Initialization (INITIAL SETUP) | 2.3.3.2 | _____ | Pass____/Fail____ |
| 4 | Charging indication | 2.3.3.2 | _____ | Pass____/Fail____ |
| 5 | Pump Mode Test | 2.3.3.2 | _____ _____ _____ _____ | Pass____/Fail____ Ch A Pass____/Fail____ Ch B Pass____/Fail____ Ch C Pass____/Fail____ Ch D |
| | Output Pressure Test | 2.3.3.2 | _____ _____ _____ _____ | Pass____/Fail____ Ch A Pass____/Fail____ Ch B Pass____/Fail____ Ch C Pass____/Fail____ Ch D |
| | Maximum Pressure Test | 2.3.3.2 | _____ _____ _____ _____ | Pass____/Fail____ Ch A Pass____/Fail____ Ch B Pass____/Fail____ Ch C Pass____/Fail____ Ch D |
| | Air-In-Line Test | 2.3.3.2 | _____ _____ _____ _____ | Pass____/Fail____ Ch A Pass____/Fail____ Ch B Pass____/Fail____ Ch C Pass____/Fail____ Ch D |

Figure 2-3. PC-2TX Abbreviated Test Data Sheet

SECTION 3 - OPERATION

3.1 INTRODUCTION

This section describes the recommended procedures for operation of the IMED® GEMINI PC-2TX® Volumetric Infusion Pump/Controller ("PC-2TX") with software release 5.10.18.4. For operating procedures for instruments with earlier software releases, refer to the Operator's Manual (Directions For Use) provided with the instrument. The information is intended to provide maintenance technicians with a basic understanding of instrument operation including the audio alerts and visual displays.

NOTE

Although the PC-2TX is built and tested to exacting specifications, it is not intended to replace the role of medical personnel in the supervision of IV infusions. The user is urged to exercise vigilance in the utilization of the PC-2TX.

3.2 CONTROLS AND INDICATORS

The controls and indicators used to set up and operate the PC-2TX are illustrated in Figure 3-1 with the functional descriptions listed in Table 3-1.

PC-2TX

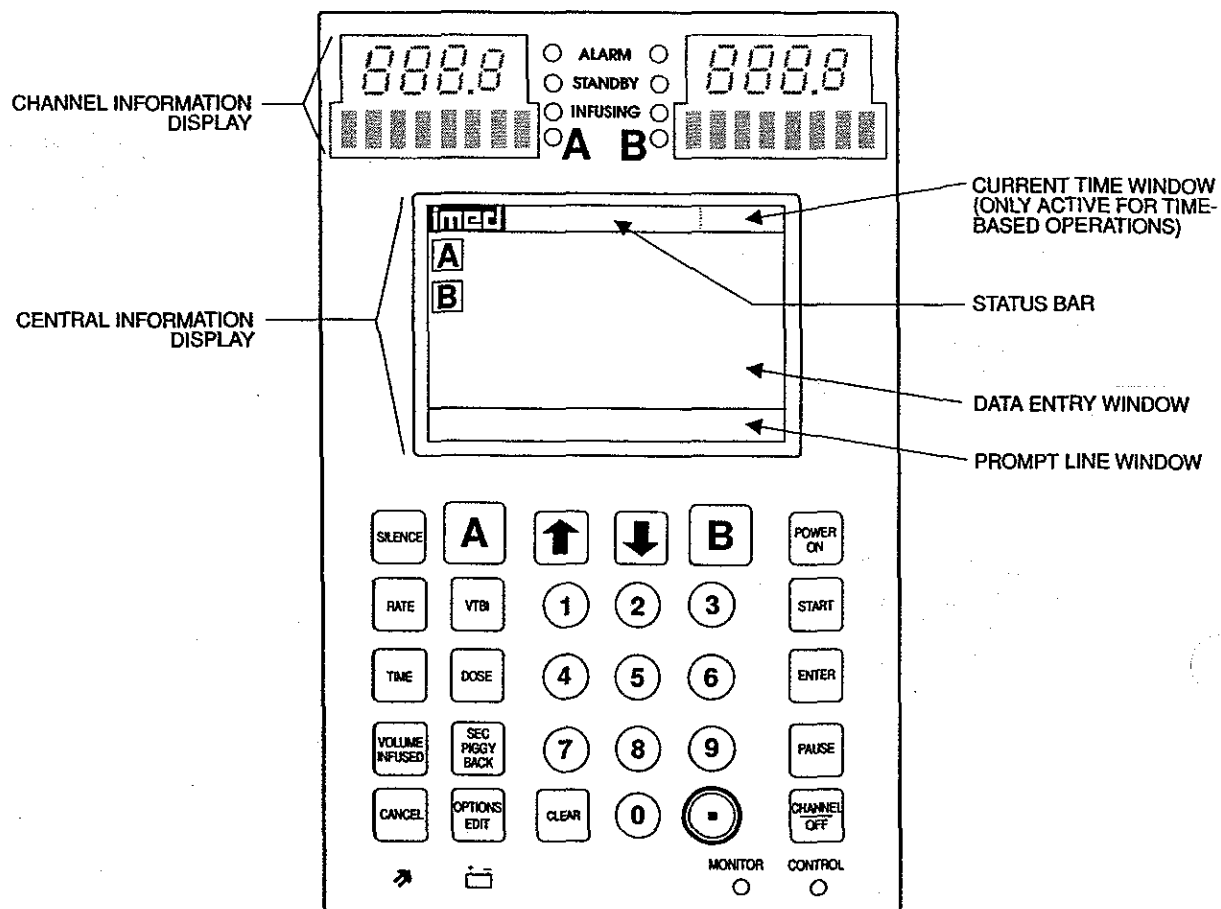


Figure 3-1. PC-2TX Front Panel Controls and Indicators

Table 3-1. DESCRIPTION OF CONTROLS AND INDICATORS

Channel Information (Alarm/Status) Display - Channel A or B displays various advisories, alarms, and malfunctions. (Refer to CHANNEL, CENTRAL INFORMATION DISPLAY AND ALARM RESPONSE PROCEDURES section of this manual for specific response procedures.)

RATE display - Channel A or B - displays primary and secondary rate infusion parameters.

Channel Select A or B indicators - when illuminated, indicate that the corresponding channel is selected for infusion parameter entry and infusion setup.

Standby indicator - illuminates when the channel is programmed for a future start time.

Alarm indicator - illuminates when the channel is in an alarm or infusion complete condition.

Infusing indicator - flashes when the channel is actively infusing.

Central Information Display - displays VTBI (volume-to-be-infused), current time of day and other operating parameters during operation of the instrument. During set up procedures, provides display for data entry, editing, confirmation and display of prompts, advisories and alarm conditions. During battery operation, approximate battery run time will display in the prompt/battery run time window. The display backlight will extinguish 2 minutes after the last keypress.

Keypad

- A** or **B** controls - when pressed once, selects the corresponding channel for infusion parameter entry and infusion setup.
- PAUSE** when pressed during an infusion, the infusion for the selected channel is stopped. (After ≈2 minutes, the "PRESS START" visual and audio prompt begins.)
- CHANNEL OFF** when pressed, stops the infusion for the selected channel, deselects the selected channel, and if only that channel had been infusing, powers off the PC-2TX. Repeat for the other running channel to power off the PC-2TX. When pressed during a software-detected system malfunction, it powers off the PC-2TX.
- RATE** when pressed, allows the rate infusion parameter on the selected channel to be changed using the appropriate data entry controls.
- VTBI** when pressed, allows the VTBI parameter on the selected channel to be changed using the appropriate data entry controls.
- 0** to **9** data entry controls - when pressed, allows sequential entry of Rate, VTBI and other numerical operating parameters.
- .** when pressed, inserts a decimal point in numeric data.
- TIME** when pressed, allows entry of time-related data inputs for delayed start and multidose infusions.

PC-2TX



when pressed, clears the currently selected infusion parameter setting to "0". When pressed following a press of the Volume Infused control, clears the total, primary and secondary volume infused displays for the selected channel.



when pressed during an alarm, silences the audio for ≈2 minutes.



and



when pressed, will increase or decrease the rate parameter with each keypress or will scroll up or down when pressed and held. Also used to select options in infusion setup sequences and to adjust contrast on the central information display through the options menu.



when pressed, applies electrical power to PC-2TX. If pressed during a hardware malfunction, silences audio alarm and turns off electrical power to all circuits.



when pressed, starts the infusion on the selected channel.



when pressed following data entry in the central information display, confirms the entry and allows entry of data for the next step of the programming sequence.



indicator - when flashing, indicates the PC-2TX is operating on battery power.



indicator - when illuminated, indicates the PC-2TX is connected to an external power source.



when pressed, will cause primary, secondary and total volume infused and secondary volume infused to display for both channels. With a channel selected, pressing will display primary, secondary and total volume infused and enable primary, secondary and total volume infused registers for clearing.



when pressed, allows the entry of secondary infusion parameters on the selected channel.



when pressed, allows the entry of a medication dose in the drug calculation mode.



when pressed, allows access to the available system or channel options and editing functions.



when pressed, discontinues the current programming sequence and returns the Central Information display to the previous display screen.

AUDIO/PANEL LOCK CONTROL (on rear panel) - when rotated, varies the audio volume; when pressed and held for 3 seconds with the tamper-resistant feature enabled, will lock out all of the keypad controls except VOLUME INFUSED, SEC/PIGGYBACK and SILENCE; a repeat 3 second press will unlock the keypad controls.

3.3 OPERATING CONDITIONS

The PC-2TX is configured for independent (Normal Operation) or as a computer controlled device (Computer Operation). Normal operation includes two patient care delivery modes - Pump and Controller. A Maintenance Mode is also provided to allow biomedical personnel to troubleshoot and service the instrument. Computer operation encompasses a Monitor and Computer Control mode. Operating procedures for both normal and computer controlled operation are described in detail in paragraphs 3.3.1 and 3.3.2 respectively. Maintenance Mode capability and operation is addressed in paragraph 5.3.2 of Section 5 of this manual.

The PC-2TX utilizes a Systems Configuration Mode to enable biomedical and other trained personnel to enable specific PC-2TX operating features. Procedures for utilizing the System Configuration Mode are discussed in Section 3.3.1.2.

3.3.1 Normal Operation

The instrument's two channels are identical in all respects. A common keypad is used for programming and control. Individual channel select controls serve to interconnect the keypad with a specific channel for setting up specific infusion programs, inputting infusion parameters, starting, pausing and/or stopping instrument operation. The following procedural steps are applicable to both channels.

The Tamper-resistant feature is enabled in the System Configuration Mode and actuated with the Audio Control switch to lock out all the keypad controls except VOLUME INFUSED and SEC/PIGGYBACK which permit monitoring infusion progress, viewing infusion parameters and CLEAR/SILENCE to clear audio alerts when permitted.

3.3.1.1 Pump Controller and Selectable Modes

The decision to use the PC-2TX's Pump or Controller delivery mode for specific IV infusions resides with the patient's attending medical personnel. The instrument's occlusion parameters are predicated on the delivery mode selected and the positioning of the IV solution container to provide a nominal head height of 24 inches (61 cm). With a 24 inch (61 cm) pressure head height and the instrument operating in the Controller mode, an occlusion will be sensed when the distal tubing in-line pressure exceeds bottle height pressure ± 12 inches (± 30.5 cm) of bottle height. In the Pump mode, occlusion pressure is pre-set to 10 ± 2 psi (69 ± 14 kPa) for rates > 30 mL/hr. At rates < 30 mL/hr,

occlusion pressure is rate dependent to ensure timely occlusion detection. Within the Systems Configuration mode, the PUMP mode occlusion pressure can be locked to 10 psi (69 kPa) for all rates. This selection will effect both channels and will significantly extend time to occlusion for rate < 30 mL/hr.

3.3.1.2 System Configuration

To enable the System Configuration mode press and hold the OPTIONS/EDIT control, then press POWER ON. System Configuration screen 1 of 5 will display. The \square \square controls are utilized to toggle between screens 1 through 5. The numeric keys are used to access a specific feature on the active screen. The selectable options are listed numerically by screen (default values are in bold print):

Clock Setup: **Military** AM/PM

- Use \square \square controls to select
- Press ENTER to confirm
- Use numeric controls to enter date mm/dd/yy
- Press ENTER to confirm
- Use numeric controls to enter time; if in AM/PM mode, use \square \square to select
- Press CANCEL to exit

Factory Set: **Yes** No

- Use \square \square to select Yes or No
- Press ENTER to Confirm

Maximum Rate: **999mL/hr** 0-999mL/hr

- Use numeric controls to enter maximum rate
- Press ENTER to confirm and exit

C2 Port:

Baud Rate: 300, 600, 1200, 2400, 4800, **9600**, 19200

- Use \square \square to select baud rate
- Press ENTER to confirm

Data Frame: **N81** (Parity, Data bits and Stop bit)

Factory set

Serial No.:

- Use numeric controls to enter Serial Number
- Press ENTER to confirm and exit

Comp. Ctrl.: **Enabled** Disabled

- Use \square \square to select
- Press ENTER to confirm

P/C/S Mode: **P,P** Pump or Controller or Selectable

- Use \square \square controls to select then press ENTER for each channel

PC Mode Setup: **Unlocked** Locked

- Use \square \square to select
- Press ENTER to confirm and exit

Delay Start: **Enabled** Disabled

- Use \square \square to select
- Press ENTER to confirm and exit

Drug Calc: **Enabled** Disabled

- Use \square \square to select

PC-2TX

- Press ENTER to confirm and exit
- Multidose: **Enabled** Disabled
 - Use to select
 - Press ENTER to confirm and exit
- Dose Display: **Fixed** Temp
 - Use to select
 - Press ENTER to confirm and exit
- Battery Mode: Disabled Normal **High**
 - Use to select
 - Press ENTER to confirm and exit
- Key Audio: **Enabled** Disabled
 - Use to select
 - Press ENTER to confirm and exit

- Alarm Audio: **Profile 1** Profile 2 Profile 3
 - Use to select
 - Press ENTER to confirm and exit
- Switch Audio: **Enabled** Disabled
 - Use to select
 - Press ENTER to confirm and exit
- Tamper Mode: **Enabled** Disabled
 - Use to select
 - Press ENTER to confirm and exit
- Language: **English** (Only selection currently available)
- Anesth. Mode: Enabled **Disabled**
 - Use to select
 - Press ENTER to confirm and exit
- Aux. Port: No Port (Not currently enabled)

Press OFF to exit System Configuration Setup mode.

3.3.1.3 Independent Setup and Operating Procedures

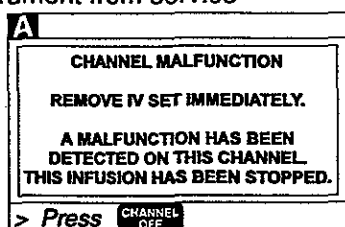
The detailed procedures necessary to set up and operate the PC-2TX on any channel are described in the following section.

ACTION/PROMPT

DISPLAY RESPONSE

To Set Up a Primary Infusion

1. Connect the PC-2TX to an external AC power source using the power cord supplied by ALARIS Medical.
2. Press .
 - If the following screen displays, remove the instrument from service



- An audio tone sounds once.

NOTE

If CHANNEL SELECT A or B control is not pressed within two minutes of pressing POWER ON, the PC-2TX will automatically power down.

3. Open the GEMINI administration set package, remove set, and close the roller clamp. Refer to the Directions For Use provided on the set packaging.

- AC Power indicator - illuminates
- Battery operation indicator - extinguishes

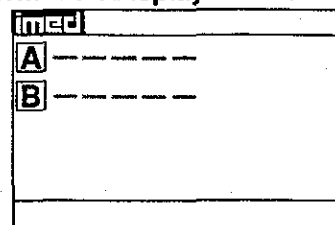
NOTE

During initialization, ensure the following occur:

Channel Information Display

- All LEDs illuminate for 3 seconds
- Rate displays show "888.8" then extinguish, except channel A which shows "----"
- Message displays illuminate then extinguish.

Central Information Display shows:



ACTION/PROMPT

DISPLAY RESPONSE

4. Insert the set spike into the prepared fluid container following accepted hospital procedure and hang the container a minimum of 24 inches above the PC-2TX.
5. Fill the drip chamber 2/3 full.
6. Open the roller clamp slowly to prime the tubing and clear air from the injection sites and tubing fitments.
7. Close the roller clamp.
8. Open the door. Install the administration set pumping chamber by properly positioning the upper fitment into the upper fitment recess, and then inserting the Flo-Stop® fitment into the Flo-Stop recess below the pump mechanism, with the arrow pointing into the pump.
9. **Press the tubing into the Air-In-Line detector.**
10. Close the door and open the roller clamp.

11. Press **A**:

- After 3 seconds "> Enter Rate Value" displays
- After 12 seconds audio prompt - sounds

Channel Information Display:

- Channel indicator - illuminates
- Rate display shows "- - - -"

Central Information Display:

| | |
|-------------------------|---------|
| A Infusion Setup | |
| RATE | - - - - |
| VTBI | - - - - |
| > Enter Rate Value | |

12. Set the rate and VTBI.

a. Press **RATE**:

- After 3 seconds "> Enter RATE Value" displays
- After 12 seconds audio prompt - sounds

Central Information Display:

| | |
|-------------------------|------------|
| A Infusion Setup | |
| RATE | - - - 0 ml |
| VTBI | - - - - |
| > Enter Rate Value | |

- b. Use numeric data entry controls to enter rate parameter

- New rate value displays

PC-2TX

ACTION/PROMPT

- c. Press **VTBI**:
- After 3 seconds "> Enter VTBI Value" displays
 - After 12 seconds audio prompt - sounds
- d. Use numeric data entry controls to enter VTBI parameter
- After 3 seconds "> Press **START**" displays
13. Attach the set to the patient's vascular access device following accepted hospital procedure.
14. Press **START**.

NOTES

Immediate air-in-line alarm after initial setup and operation may indicate that the administration set is not properly installed in the Air-In-Line detector.

If enabled in System Configuration, the tamper-resistant feature may be initiated at this point. Press and hold the AUDIO control (rear panel) for 3 seconds until an audio tone sounds. The front panel is now locked out, and "PANEL KEYPAD LOCKED" will display for 3 seconds. The only controls that are operable are **SILENCE** and **VOLUME** (for viewing only). The infusion may not be altered in any way until the tamper-resistant feature is canceled by repeating the 3 second AUDIO control press.

During infusion:

NOTE

Various Advisories, Alarms, and Malfunctions may be displayed. Refer to the CHANNEL AND CENTRAL INFORMATION DISPLAY AND ALARM RESPONSE PROCEDURES section in this manual for an explanation and appropriate response.

Upon completion of the infusion:

- Audio Prompt sounds.

DISPLAY RESPONSE

Central Information Display:

| | |
|-------------------------|-----------|
| A Infusion Setup | |
| RATE | 125 mL/hr |
| VTBI | 0 mL |
| > Press START | |

- New VTBI value displays

Channel Information Display:

- INFUSION indicator - flashes
- Rate display - Rate value displays

Central Information Display:

| | |
|--------------|---------------|
| linep | |
| A | VTBI = 500 mL |
| B | |

Channel Information Display:

- INFUSING indicator - flashes

Central Information Display:

- VTBI value - decrements

Channel Information Display:

- "INFUSION COMPLETE-KVO" scrolls
- Rate display - shows 1 or set rate if <1.0 mL/hr
- ALARM indicator - flashes

ACTION/PROMPT

DISPLAY RESPONSE

Central Information Display:

| |
|---------|
| IMED |
| A KVO |
| B ----- |
| |
| |

To Set Up a Primary Infusion with Volume/Time Option Enabled

1. Connect the PC-2TX to an external AC power source using the power cord supplied by IMED.

- AC Power indicator - illuminates
- Battery operation indicator - extinguishes


2. Press **POWER ON**.

- An audio tone sounds once.

NOTE

If CHANNEL SELECT A or B control is not pressed within two minutes of pressing POWER ON, the PC-2TX will automatically power down.

Channel Information Display

- All LEDs illuminate for 3 seconds
- Rate displays show "888.8" then extinguish, except channel A which shows "- - - -"
- Message displays illuminate  then extinguish.

Central Information Display shows:

| |
|---------|
| IMED |
| A ----- |
| B ----- |
| |
| |

3. Prime and load the Gemini administration set as previously described under: **To Set up a Primary Infusion.**

4. Press **A**:

- After 3 seconds "> Enter Rate Value" displays
- After 12 seconds audio prompt - sounds

Channel Information Display:

- Channel indicator - illuminates
- Rate display shows "- - - -"

Central Information Display:

| | |
|--------------------|----------------|
| A | Infusion Setup |
| RATE | ----- |
| VTBI | ----- |
| DURATION | ----- |
| > Enter Rate Value | |

PC-2TX

ACTION/PROMPT

5. Set the VTBI and duration

- a. Press **VTBI**:
 - After 3 seconds "> Enter VTBI Value" displays
 - After 12 seconds audio prompt - sounds
- b. Use numeric data entry controls to enter VTBI parameter
- c. Press **TIME** or **ENTER**.
 - After 3 seconds "> Enter Rate Value" displays
 - After 12 seconds audio prompt - sounds
- d. Use numeric data entry controls to enter duration parameter
 - As duration parameters are entered, the rate value displays
 - After 3 seconds "> Press **START**" displays

NOTE

It is acceptable to enter either a rate and VTBI or a VTBI and duration. If a rate and VTBI are entered that result in a duration of less than 1 minute, the duration will display as "<1 minute."

6. Attach the set to the patient's vascular access device following accepted hospital procedure.

7. Press **START**.

DISPLAY RESPONSE

Central Information Display:

| A Infusion Setup | |
|--------------------|------|
| RATE | |
| VTBI | 0 ml |
| DURATION | |
| > Enter VTBI Value | |

- New VTBI value displays

Central Information Display:

| A Infusion Setup | |
|--------------------|------------|
| RATE | 125 ml/hr |
| VTBI | 1000 ml |
| Duration | 8:00 hh:mm |
| > Enter Rate Value | |

- New duration value displays
- Calculated rate value displays

Channel Information Display:

- INFUSION indicator - flashes
- Rate display - Rate value displays

Central Information Display:

| med | |
|-----|----------------|
| A | VTBI = 1000 ml |
| B | |
| | |

ACTION/PROMPT

DISPLAY RESPONSE

During infusion:

NOTE

Various Advisories, Alarms, and Malfunctions may be displayed. Refer to the **CHANNEL AND CENTRAL INFORMATION DISPLAY AND ALARM RESPONSE PROCEDURES** section in this manual for an explanation and appropriate response.

Upon completion of the infusion:

- Audio prompt sounds.

Channel Information Display:

- INFUSING indicator - flashes

Central Information Display:

- VTBI value - decrements

Channel Information Display:

- "INFUSION COMPLETE-KVO" scrolls
- Rate display - shows 1 or set rate if <1.0 mL/hr
- ALARM indicator - flashes

Central Information Display:

| |
|---------|
| imed |
| A KVO |
| B ----- |
| |
| |

To Adjust Central Information Display Contrast

1. Press **OPTIONS** **EDIT** (do not select channel first).
 - After 3 seconds "> Press **CANCEL** to Exit" displays

Central Information Display:

| | |
|-------------------------------|----------------------|
| imed | System Options |
| 1 | Display Contrast |
| 2 | Time-of-Day |
| 3 | Anesthesia Mode |
| 4 | Computer Control |
| 5 | System Configuration |
| > Press CANCEL to Exit | |

2. Press **1**:

Central Information Display:

| | | | |
|-----------------------------------|------|------|------|
| imed Display Contrast | | | |
| imed | imed | imed | imed |
| imed | imed | imed | imed |
| imed | imed | imed | imed |
| > Use ↑ ↓ to Adjust | | | |

3. Use the **↑** **↓** controls to adjust the contrast of the central display.
 - After 3 seconds "> Press **ENTER** to confirm" displays

Central Information Display:

- Display contrast increases with each press of **↑** and decreases with each press of **↓**.

4. Press **ENTER**.

Central Information Display:

- Returns to System Options screen

PC-2TX

ACTION/PROMPT

5. Press **CANCEL** to return to initial screen

To Pause an Infusion

1. Press **A** or **B** to select channel
 - After 3 seconds "> Press **CANCEL**" displays
 - After 12 seconds audio prompt - sounds
2. Press **PAUSE**.
 - After 3 seconds "> Press **START**" displays
 - After 12 seconds audio prompt - sounds. (In anesthesia mode, audio is disabled.)
3. Press **START** to resume the infusion.

To Stop a Primary Infusion

1. Press **A** or **B** to select channel
 - After 3 seconds "> Press **START**" displays
 - After 12 seconds audio prompt - sounds

DISPLAY RESPONSE

- Central Information Display:
- Returns to initial screen

- Channel Information Display:
- Channel indicator - illuminates
 - INFUSING indicator - flashes
- Central Information Display:

| | |
|-------------------------|-----------|
| A Infusion Setup | |
| RATE | 125 ml/hr |
| VTBI | 500 ml |
| > Press START | |

- Channel Information Display:
- INFUSING indicator - extinguishes
 - STANDBY indicator - flashes
 - "PAUSE" advisory scrolls.
- Central Information Display:
- NO CHANGE

- Channel Information Display:
- STANDBY indicator - extinguishes
 - INFUSING indicator - flashes
 - Message display - blanks
- Central Information Display:
- Returns to infusing screen

- Channel Information Display:
- Channel indicator - illuminates
- Central Information Display:

| | |
|-------------------------|-----------|
| A Infusion Setup | |
| RATE | 125 ml/hr |
| VTBI | 500 ml |
| > Press START | |

- Channel indicator - flashes

ACTION/PROMPT

2. Press **CHANNEL OFF**.

NOTE

If only one channel is in use, the PC-2TX will automatically power down.

DISPLAY RESPONSE

Channel Information Display:

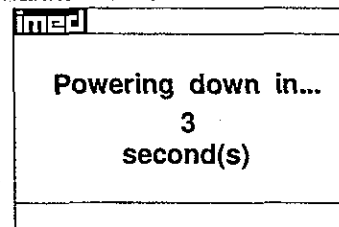
- INFUSING indicator - extinguishes
- Channel indicator - extinguishes
- Rate display - blanks

Central Information Display:

- Selected channel display - extinguishes

or

if only one channel active:



- Time value decrements from 3 to 1, then the PC-2TX powers down

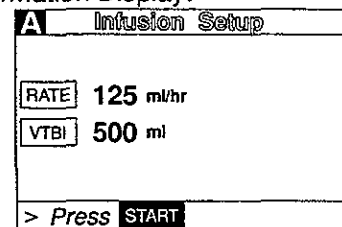
To Change Rate or VTBI During Primary Infusion

1. Press **A** or **B** to select channel.
 - After 3 seconds "> Press **START**" displays
 - After 12 seconds audio prompt - sounds

Channel Information Display:

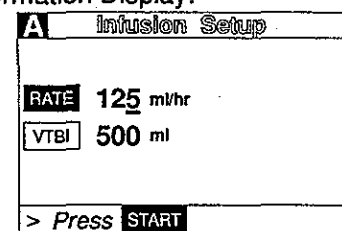
- Channel indicator - illuminates

Central Information Display:



2. Press **RATE** or **VTBI**.
 - After 3 seconds "> Press **START**" displays
 - After 12 seconds audio prompt - sounds

Central Information Display:



3. Use the numeric data entry controls to change rate or VTBI. The **↑** **↓** controls can also be used to change rate.
 - After 3 seconds "> Press **START**" displays
 - After 12 seconds audio prompt - sounds

Channel Information Display:

NO CHANGE

Central Information Display:

- Rate or VTBI parameter changes to new value

PC-2TX

ACTION/PROMPT

DISPLAY RESPONSE

4. Press **START**.

NOTES

If new rate and/or VTBI parameters have been selected, but not confirmed by pressing **START** or **PAUSE**; the currently confirmed parameters can be recalled by pressing Rate (VTBI), then pressing the **CANCEL** control.

If the Volume/Time infusion option has been enabled, the duration parameter may also be changed as described above for Rate and VTBI.

Channel Information Display:

- New rate value displays

Central Information Display:

- Returns to active infusion screen

NOTE

An infusion setup sequence may be interrupted to respond to a situation on the other channel by selecting that channel, taking appropriate action and then pressing **START**. To return to the interrupted infusion setup, reselect the channel, press **ENTER** to continue the programming sequence or press **CANCEL** to return to the original operating parameters.

To Titrate RATE

1. Press **A** or **B** to select channel.

Channel Information Display:

- Channel indicator - illuminates

Central Information Display:

- Infusion Setup screen displays

2. Use **↑** control to increase or **↓** control to decrease the rate parameter in 1 or 0.1 mL/hr increments

or

Press and hold the **↑** or **↓** control to scroll to a new rate parameter.

- After 3 seconds "> Press **START**" displays
- After 12 seconds audio prompt - sounds

Channel Information Display:

NO CHANGE

Central Information Display:

- Rate graphic is highlighted
- New rate value is displayed

3. Press **START**.

Channel Information Display:

- New rate value displays

Central Information Display:

- Returns to active infusion screen

NOTE

There are three operating pressure limits that can be enabled: the Pump mode (P) which automatically sets the occlusion pressure based on the rate of infusion, the Controller mode (C) which senses the gravity pressure and adjusts the occlusion detection to this measurement and the Selectable (S) mode which allows the operator to set the occlusion detection pressure from 25 to 517 mm Hg (0.5 to 10 psi). During operation in the P and S pressure modes, the dynamic pressure detected at the pump is displayed for each channel. To ensure accuracy of this measurement, set the height of the IV fluid 24 inches above the mid-point of the instrument.

ACTION/PROMPT

DISPLAY RESPONSE

To Change the Pressure Limit Mode (PCS Mode control unlocked)

1. Press **A** or **B** to select channel.
2. Press **OPTIONS EDIT**.
 - After 3 seconds "> Press 1-5 or **↑** or Cancel" displays
 - After 12 seconds audio prompt - sounds

Channel Information Display:
 • Channel indicator - illuminates
 Central Information Display:
 • Infusion Setup screen displays

Channel Information Display:
 NO CHANGE
 Central Information Display:

| | | |
|-----------------------------------|------------------------|--------|
| A | Chan Options | 1 of 2 |
| 1 | Delayed Start | |
| 2 | Drug Calculation Setup | |
| 3 | Pressure History | |
| 4 | Pressure Limits - P | |
| 5 | Stop Infusion | |
| > Press 1-5 or ↑ or Cancel | | |

3. Press **4**.
 - After 3 seconds "> Press 1-5 or **↑** or Cancel" displays
 - After 12 seconds audio prompt - sounds

Channel Information Display:
 NO CHANGE
 Central Information Display:

| | |
|---------------------------------|----------------|
| A | Pressure Limit |
| Controller | |
| Pump | ↑↓ |
| Selectable | |
| > Press ENTER to Confirm | |

4. Use **↑↓** to select "Pump", "Controller" or "Selectable."
 - After 3 seconds "> Press Enter to Confirm" displays

Channel Information Display:
 NO CHANGE
 Central Information Display:
 • When option is selected, option screen is entered.

NOTE

If selectable pressure mode is chosen, press **ENTER** and then use **↑↓** controls to select the desired patient side occlusion pressure limit (between 25 and 517 mmHg in 25 mmHg increments), then press **ENTER** to confirm.

5. Press **ENTER**.
 - After 3 seconds "> Press 1-5 or **↑** or Cancel" displays
 - After 12 seconds audio prompt - sounds

Channel Information Display:
 NO CHANGE
 Central Information Display:
 • Channel Options screen displays

6. Press **CANCEL**.
 - If PCS Mode is changed during an active infusion, press **START** to resume infusion.

Channel Information Display:
 NO CHANGE
 Central Information Display:
 • Infusion Setup screen displays

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ACTION/PROMPT

DISPLAY RESPONSE

To View Pressure History for Selected Channel

NOTE

The pressure history screen provides the previous 2 hours of average operating pressure. Each vertical line represents a 2 minute average. The ← on the right side represents the occlusion pressure set point. A "+" in the upper portion of the screen indicates one or more occlusion alarms occurred during the 2 minute history period. The history display is reset when the channel is turned off. The number in the right margin is the current pressure readout in mmHg.

1. Press **A** or **B** to select channel
 - After 3 seconds "> Press **START**" displays
 - After 12 seconds audio prompt - sounds

2. Press **OPTIONS**
EDIT
 - After 3 seconds "> Press 1-5 or **↑** or Cancel" displays
 - After 12 seconds audio prompt - sounds

3. Press **3**
 - After 3 seconds "> Press Cancel to Exit" displays
 - After 12 seconds audio prompt - sounds

4. Press **CANCEL**

Channel Information Display:

- Channel indicator - illuminates

Central Information Display:

- Infusion Setup screen displays

Channel Information Display:

NO CHANGE

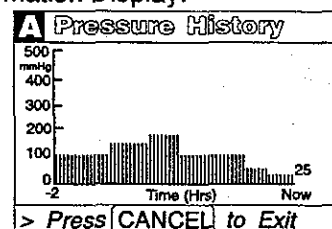
Central Information Display:

| A Chan Options 1 of 2 | |
|-----------------------------------|-------------------------|
| 1 | Delayed Start |
| 2 | Drug Calculation Setup |
| 3 | Pressure History |
| 4 | Press. Limits: 350 mmHg |
| 5 | Stop Infusion |
| > Press 1-5 or ↑ or Cancel | |

Channel Information Display:

NO CHANGE

Central Information Display:



Channel Information Display:

- Channel indicator - illuminates

Central Information Display

- Returns to active infusion screen

To Restart an Infusion Following an "INFUSION COMPLETE - KVO" or "EMPTY CONTAINER-KVO" advisory

1. Press **A** or **B** to select channel.
 - After 3 seconds "> Enter VTBI Value" displays

Channel Information Display:

- Rate display shows "1" or a fractional rate if set rate is <1.0 mL/hr
- "INFUSION COMPLETE-KVO" or "EMPTY CONTAINER-KVO" scrolls

ACTION/PROMPT

DISPLAY RESPONSE

Central Information Display:

| | |
|-------------------------|-----------|
| A Infusion Setup | |
| RATE | 125 ml/hr |
| VTBI | 0 ml |
| > Enter VTBI Value | |

2. Press **VTBI**.

Channel Information Display:

NO CHANGE

Central Information Display:

| | |
|-------------------------|-----------|
| A Infusion Setup | |
| RATE | 125 ml/hr |
| VTBI | 0 ml |
| > Enter VTBI Value | |

3. Use the numeric data entry controls to set a new VTBI.

Channel Information Display:

NO CHANGE

Central Information Display:

- New VTBI displays

4. Replace solution container and refill drip chamber, if necessary.

5. Change rate, if necessary.

6. Press **START**.

Channel Information Display:

- Set rate displays
- INFUSING indicator - flashes
- Message display - blanks

Central Information Display:

- Returns to active infusion screen

NOTE

If the Volume/Time infusion option has been enabled, the duration parameter may also be changed as described above for Rate and VTBI.

To View Primary, Secondary and Total Volume Infused for both Channels Simultaneously

1. Press **VOLUME INFUSED**.

Channel Information Display:

NO CHANGE

- Active channel indicators are highlighted

PC-2TX

ACTION/PROMPT

DISPLAY RESPONSE

Central Information Display:

| Ined Volume Infused * | | | |
|-----------------------|-------|--------|--------|
| | PRI | SEC | TOTAL |
| A | 351.1 | + 25.0 | =376.1 |
| B | 0.0 | + 0.0 | =0.0 |

* Example Values

To Clear Primary, Secondary and Total Volume Infused for both Channels Simultaneously

1. Press **VOLUME INFUSED**.

- Active channel indicators are highlighted

Channel Information Display:

NO CHANGE

Central Information Display:

| Ined Volume Infused | | | |
|---------------------|-------|--------|--------|
| | PRI | SEC | TOTAL |
| A | 351.1 | + 25.0 | =376.1 |
| B | 0.0 | + 0.0 | =0.0 |

2. Press **CLEAR**.

- After 3 seconds "> Select Option/Cancel" displays
- After 12 seconds audio prompt - sounds

Channel Information Display:

NO CHANGE

Central Information Display:

| Ined Volume Infused | | | |
|------------------------|----------------------------|-----|-------|
| | PRI | SEC | TOTAL |
| A | Clear VI for all Channels? | | No |
| B | | | Yes |
| | | | ↑ ↓ |
| > Select Option/Cancel | | | |

3. Use **↑** **↓** to select "Yes".

- After 3 seconds "> Press **ENTER** to confirm" displays
- After 12 seconds audio prompt - sounds

Channel Information Display:

NO CHANGE

Central Information Display:

- Selected option is highlighted

4. Press **ENTER**.

Channel Information Display:

NO CHANGE

Central Information Display:

- Returns to active infusion screen

To View Primary, Secondary and Total Volume Infused on Selected Channel

1. Press **A** or **B** to select channel.

- After 3 seconds "> Press **START**" displays
- After 12 seconds audio prompt - sounds

Channel Information Display:

- Channel indicator - illuminates

Central Information Display:

- Infusion Setup screen displays

ACTION/PROMPT

2. Press **VOLUME INFUSED**.

3. Press **START** or **CANCEL** to deselect channel.

To Clear Primary, Secondary and Total Volume Infused on Selected Channel

1. Press **A** or **B** to select channel.
 - After 3 seconds "> Press **START**" displays
 - After 12 seconds audio prompt - sounds

2. Press **VOLUME INFUSED**.

3. Press **CLEAR** while the Volume Infused screen is displaying to clear all Values to "0".

DISPLAY RESPONSE

Channel Information Display:
NO CHANGE

Central Information Display:

- Channel specific volume infused screen displays for 10 seconds:

| A Volume Infused | |
|------------------|----------|
| PRI | 351.1 ml |
| SEC | 25.0 ml |
| TOTAL | 376.1 ml |

- After 10 seconds the Infusion Setup screen re-displays

Channel Information Display:

- Channel indicator - extinguishes

Central Information Display:

- Returns to active infusion screen

Channel Information Display:

- Channel indicator - illuminates

Central Information Display:

- Infusion Setup screen displays

Channel Information Display:

NO CHANGE

Central Information Display:

- Channel specific volume infused screen displays for 10 seconds:

| A Volume Infused | |
|------------------|----------|
| PRI | 351.1 ml |
| SEC | 25.0 ml |
| TOTAL | 376.1 ml |

Channel Information Display:

NO CHANGE

Central Information Display:

| A Volume Infused | |
|------------------|--------|
| PRI | 0.0 ml |
| SEC | 0.0 ml |
| TOTAL | 0.0 ml |

- After 10 seconds the Infusion Setup screen re-displays

PC-2TX

ACTION/PROMPT

4. Press **START** or **CANCEL** to deselect channel.

To Set Up Secondary (Piggyback) Infusion With Dual Rates

1. Set up and start the Primary infusion (using a check valve administration set) as described in **To Set Up a Primary Infusion**.
 - The Secondary infusion may be set up prior to or after starting a Primary infusion.
2. Open the ALARIS Medical GEMINI Secondary administration set package, remove set, and close clamp.
3. Insert the set spike into the prepared fluid container and hang the Secondary container following accepted hospital procedure.
4. Fill the drip chamber $\approx 2/3$ full.
5. Open Secondary clamp and prime the set. Close clamp.
6. Attach the Secondary set to the upper injection site on the Primary set.
7. Lower the Primary fluid container using the hanger provided with the Secondary set.
8. Press **A** or **B** to select channel.

9. Press **SEC PIGGY BACK**.
- After 3 seconds "> Enter Rate Value" displays
 - Rate parameter is automatically selected

10. Use numeric data entry or **↑** **↓** controls to enter or change rate value
- After 3 seconds ">Enter VTBI Value" displays
 - After 12 seconds audio prompt - sounds

DISPLAY RESPONSE

Channel Information Display:

- Channel indicator - extinguishes
- ### Central Information Display:
- Returns to active infusion screen

Channel Information Display:

- Channel indicator - illuminates
 - INFUSING indicator - continues flashing
- ### Central Information Display:
- Infusion Setup screen displays

Channel Information Display:

NO CHANGE

Central Information Display:

| A Infusion Setup | | |
|--------------------|-----|---------|
| | PRI | SEC |
| RATE | 125 | 0 ml/hr |
| VTBI | 500 | ml |
| > Enter Rate Value | | |

Channel Information Display:

NO CHANGE

Central Information Display:

- New rate value displays

ACTION/PROMPT

11. Press **VTBI**.
 - After 3 seconds "> Enter VTBI Value" displays
 - After 12 seconds audio prompt - sounds
12. Use numeric data entry controls to enter or change VTBI value, then press **ENTER** to confirm.
 - After 3 seconds "> Press **START**" displays
 - After 12 seconds audio prompt - sounds

NOTE

Verify that the Secondary VTBI does not exceed the contents of the Secondary fluid container.

13. Open clamp on the Secondary set.

14. Press **START**.

During Infusion:

NOTE

Various Advisories, Alarms, and Malfunctions may be displayed. Refer to the CHANNEL, CENTRAL INFORMATION DISPLAY AND ALARM RESPONSE PROCEDURES section in this manual for an explanation and appropriate response.

Upon Completion of the Secondary infusion:

- Switchover audio alert (6 beeps) - sounds (unless disabled in System Configuration)

NOTE

Actual changeover from the Secondary to the Primary IV solution is accomplished independently of pump/controller operation and occurs when the fluid level in the Secondary container drops to the same level as the fluid level in the Primary fluid container.

DISPLAY RESPONSE

Channel Information Display:

NO CHANGE

Central Information Display:

- Last programmed secondary VTBI value displays

Channel Information Display:

NO CHANGE

Central Information Display:

| A Infusion Setup | | | |
|----------------------|-----|-----|-------|
| | PRI | SEC | |
| RATE | 125 | 100 | ml/hr |
| VTBI | 500 | 50 | ml |
| > Press START | | | |

Channel Information Display:

- Channel indicator - extinguishes
- Secondary rate - displays
- "SECONDARY" message scrolls

Central Information Display:

| imed | |
|------|------------------|
| A | VTBI = 50 ml SEC |
| B | |

Channel Information Display:

- INFUSING indicator - flashes
- Secondary rate - displays

Central Information Display:

- VTBI (Secondary) - decrements

Channel Information Display:

- Primary rate displays
- Message screen clears

Central Information Display:

| imed | |
|------|-------------------|
| A | VTBI = 500 ml PRI |
| B | |

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ACTION/PROMPT

DISPLAY RESPONSE

To Set Up Secondary (Piggyback) Infusion With Dual Rates and Volume/Time Infusion Option Enabled

1. Set up and start the Primary infusion (using a check valve administration set) as previously described.
 - The Secondary infusion may be set up prior to or after starting a Primary infusion.
2. Set up the IMED Secondary administration set as previously described.
3. Press **A** or **B** to select channel.

4. Press **SEC PIGGY BACK**.
 - After 3 seconds "> Enter Rate Value" displays
 - After 12 seconds audio prompt - sounds

5. Press **VTBI**.
 - After 3 seconds "> Enter VTBI Value" displays
 - After 12 seconds audio prompt - sounds

6. Use numeric data entry controls to enter or change VTBI value
 - After 12 seconds audio prompt - sounds

7. Press **TIME** or **ENTER**.
 - After 3 seconds "> Press **START**" displays
 - After 12 seconds audio prompt - sounds

Channel Information Display:

- Channel indicator - illuminates
- INFUSING indicator - continues flashing

Central Information Display:

- Infusion Setup screen displays

Channel Information Display:

NO CHANGE

Central Information Display:

| A Infusion Setup | | | |
|--------------------|------|------|-------|
| | PRI | SEC | |
| RATE | 125 | ---- | ml/hr |
| VTBI | 500 | ---- | ml |
| Duration | ---- | | |
| > Enter Rate Value | | | |

Channel Information Display

NO CHANGE

Central Information Display

| A Infusion Setup | | | |
|--------------------|------|------|-------|
| | PRI | SEC | |
| RATE | 125 | ---- | ml/hr |
| VTBI | 500 | 0 | ml |
| Duration | ---- | | |
| > Enter VTBI Value | | | |

Channel Information Display

NO CHANGE

Central Information Display

- New VTBI value displays

Channel Information Display

NO CHANGE

Central Information Display

- Last programmed duration displays

ACTION/PROMPT

8. Use numeric data entry controls to enter or change duration
 - Rate value is calculated and displayed
 - After 3 seconds "> Press **START**" displays
 - After 12 seconds audio prompt - sounds

NOTES

Verify that the Secondary VTBI does not exceed the contents of the Secondary fluid container.

It is acceptable to enter either a VTBI/Duration or a Rate/VTBI as the Secondary infusion parameters when the Volume/Time infusion option is enabled.

9. Open clamp on the Secondary set.

10. Press **START**.

DISPLAY RESPONSE

Channel Information Display:

NO CHANGE

Central Information Display:

| A Infusion Setup | | | |
|----------------------|-----|-----|-------|
| | PRI | SEC | |
| RATE | 125 | 100 | ml/hr |
| VTBI | 500 | 50 | ml |
| Duration | :30 | | hh:mm |
| > Press START | | | |

Channel Information Display:

- Channel Indicator - extinguishes
- Secondary rate - displays
- "SECONDARY" message scrolls

Central Information Display:

| med | |
|-----|-------------------------|
| A | VTBI = 50 ml SEC |
| B | |

During Infusion:

NOTE

Various Advisories, Alarms, and Malfunctions may be displayed. Refer to the CHANNEL, CENTRAL INFORMATION DISPLAY AND ALARM RESPONSE PROCEDURES section in this manual for an explanation and appropriate response.

Upon Completion of the Secondary infusion:

- Switchover audio alert (6 beeps) - sounds (unless disabled in System Configuration)

NOTE

Actual changeover from the Secondary to the Primary IV solution is accomplished independently of pump/controller operation and occurs when the fluid level in the Secondary container drops to the same level as the fluid level in the Primary fluid container.

Channel Information Display:

- INFUSING indicator - flashes
- Secondary rate - displays

Central Information Display:

- VTBI (Secondary) - decrements

Channel Information Display:

- Primary rate displays
- Message screen clears

Central Information Display:

| med | |
|-----|--------------------------|
| A | VTBI = 500 ml PRI |
| B | |

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ACTION/PROMPT

DISPLAY RESPONSE

To Change Primary Infusion Parameters During Secondary Infusion

1. Press **A** or **B** to select channel.
 - After 3 seconds "> Press **START**" displays
 - After 12 seconds audio prompt - sounds
2. Press **SEC PIGGY BACK**.
 - After 3 seconds "> Press **START** to Confirm" displays
3. Use numeric data entry or **↑** **↓** controls to change primary rate value.
4. Press **VTBI** to change primary VTBI.
5. Use numeric data entry controls to change primary VTBI.
 - After 3 seconds "> Press Enter to Confirm" displays
 - After 12 seconds audio prompt - sounds
6. Press **SEC PIGGY BACK**.
 - After 3 seconds "> Press **START**" displays
 - After 12 seconds audio prompt - sounds

Channel Information Display:
 • Channel indicator - illuminates
 Central Information Display:

| A Infusion Setup | | | |
|----------------------|-----|-----|-------|
| | PRI | SEC | |
| RATE | 125 | 100 | ml/hr |
| VTBI | 500 | 50 | ml |
| > Press START | | | |

Channel Information Display:
 NO CHANGE
 Central Information Display:

| A Infusion Setup | | | |
|----------------------|-----|-----|-------|
| | PRI | SEC | |
| RATE | 125 | 100 | ml/hr |
| VTBI | 500 | 50 | ml |
| > Press START | | | |

Channel Information Display:
 NO CHANGE
 Central Information Display:
 • New primary rate value displays

Channel Information Display:
 NO CHANGE
 Central Information Display:
 • Cursor displays under VTBI value
 • VTBI is highlighted

Channel Information Display:
 NO CHANGE
 Central Information Display:
 • New primary VTBI value displays

Channel Information Display:
 NO CHANGE
 Central Information Display:

| A Infusion Setup | | | |
|----------------------|------|-----|-------|
| | PRI | SEC | |
| RATE | 120 | 100 | ml/hr |
| VTBI | 1000 | 50 | ml |
| > Press START | | | |

ACTION/PROMPT

DISPLAY RESPONSE

7. Press **START**.

Channel Information Display:

- Channel indicator - extinguishes

Central Information Display:

- Active Secondary Infusion screen displays

To Stop a Secondary Infusion and Return to the Primary Infusion

1. Press **A** or **B** to select channel.

- After 3 seconds "> Press **START**" displays
- After 12 seconds audio prompt - sounds

2. Press **SEP PIGGY BACK**.

- After 3 seconds "> Press **START**" displays

Channel Information Display:

- Channel indicator - illuminates

Central Information Display:

- Secondary Infusion Setup screen displays

Channel Information Display:

NO CHANGE

Central Information Display:

| A Infusion Setup | | |
|----------------------|-----|-----------|
| | PRI | SEC |
| RATE | 125 | 100 ml/hr |
| VTBI | 500 | 50 ml |
| > Press START | | |

3. Close Secondary clamp.

4. Press **START**.

Channel Information Display:

NO CHANGE

Central Information Display:

| A Infusion Setup | | |
|------------------------|-----|-----------|
| | PRI | SEC |
| RATE | 125 | 100 ml/hr |
| VTBI | 500 | 50 ml |
| Switchover to Primary? | | |
| | No | Yes |
| | ↑ | ↓ |
| > Press START | | |

5. Use **↑** or **↓** to select "Yes" option.

Central Information Display:

- "Yes" option is highlighted

6. Press **START**.

- The secondary infusion stops and the primary infusion starts.
- Switchover audio alert (6 beeps) sounds (unless disabled in System Configuration).

Channel Information Display:

- Rate changes to Primary value
- Channel indicator - extinguishes

Central Information Display:

- Primary active infusion screen displays

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ACTION/PROMPT

To Change the Time of Day

1. Press .



2. Press .

- After 12 seconds audio prompt - sounds

NOTE

If a Delayed Start or Multidose is active, "> Delay Mode is Active" will display and Time-of-Day display screen can not be accessed.

3. Use numeric data entry controls to enter the new time.

4. Use  or  to select AM or PM, if clock is in the AM/PM mode.

5. Press  to confirm.

6. Press .

DISPLAY RESPONSE

Channel Information Display:
NO CHANGE

Central Information Display:

| imed System Options | |
|--------------------------|----------------------|
| 1 | Display Contrast |
| 2 | Time-of-Day |
| 3 | Anesthesia Mode |
| 4 | Computer Control |
| 5 | System Configuration |
| > Press (CANCEL) to Exit | |

Central Information Display:

| imed Time | |
|-------------|-------------|
| Time-of-Day | |
| TIME: | 1 0 0 0 hrs |

Central Information Display:

- New time displays

Channel Information Display:
NO CHANGE

Central Information Display:
• System Options screen displays

Channel Information Display:
NO CHANGE

Central Information Display:
• Infusion setup or active screen displays

To Set Up a Delayed Start Infusion

NOTE

Since by definition, a Delayed Start Infusion will not be infusing for a programmed period of time, it is assumed that another infusing IV line will keep the vein open until the delayed start infusion begins. No KVO (Keep Vein Open) infusion precedes or follows a Delayed Start program.

1. Prime and load the primary disposable administration set as previously described.

ACTION/PROMPT

2. Press **A** or **B** to select channel
 - "Enter Rate Value" displays after 3 seconds.
 - After 12 seconds audio prompt - sounds

3. Press **OPTIONS EDIT**.
 - After 3 seconds "> Press 1-5 or **↑** or Cancel" displays
 - After 12 seconds audio prompt - sounds

4. Press **1**.
 - After 3 seconds "> Enter Rate Value" displays
 - After 12 seconds audio prompt - sounds

NOTE

If this is the first Delayed Start (or Multidose) Setup following POWER ON, the following pop-up display appears:

If the time displayed in the upper right corner of the display is correct, press **ENTER** to continue. If the time displayed is incorrect, press **OPTIONS EDIT**. The following pop-up display appears:

Enter the correct Time of Day and press **ENTER**.

DISPLAY RESPONSE

Channel Information Display:

- Channel indicator - illuminates
- RATE display shows "----".

Central Information Display:

- Infusion Setup screen displays

Channel Information Display:

NO CHANGE

Central Information Display:

| | | |
|-----------------------------------|------------------------|--------|
| A | Chan Options | 1 of 2 |
| 1 | Delayed Start | |
| 2 | Drug Calculation Setup | |
| 3 | Pressure History | |
| 4 | Pressure Limits - P | |
| 5 | Stop Infusion | |
| > Press 1-5 or ↑ or Cancel | | |

Channel Information Display:

NO CHANGE

Central Information Display:

| | | |
|--------------------|---------|----------|
| A | Delayed | 1154 hrs |
| RATE | 0 ml/hr | |
| VTBI | ----- | |
| START TIME | ----- | |
| Callback Alert? | No | |
| > Enter Rate Value | | |

| |
|-------------------------|
| Confirm Current Time |
| 1154 hrs |
| Press ENTER to confirm. |
| Press OPTIONS to edit. |

| |
|--------------|
| Current Time |
| 1154 hrs |

NOTE

If the Volume/Time infusion option is enabled, the Delayed Start Infusion setup screen will include a "Duration" parameter that will display between the VTBI and START TIME lines as shown below:

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ACTION/PROMPT

The duration parameter is calculated based upon the Rate and VTBI inputs. A duration value can not be entered directly in the Delayed Start mode.

5. Press **RATE**.
 - After 3 seconds "> Enter Rate Value" displays
 - After 12 seconds audio prompt - sounds
6. Use numeric data entry or **↑** **↓** controls to input or change rate value
 - After 3 seconds "> Enter VTBI Value" displays
 - After 12 seconds audio prompt - sounds
7. Press **VTBI**.
 - After 3 seconds "> Enter VTBI Value" displays
 - After 12 seconds audio prompt - sounds
8. Use numeric data entry controls to input or change VTBI value
 - After 3 seconds "> Enter Start Time" displays
 - After 12 seconds audio prompt - sounds
9. Press **TIME**.
 - After 3 seconds "> Enter Start Time" displays
 - After 12 seconds audio prompt - sounds
10. Use numeric data entry controls to enter start time (use **↑** **↓** to select AM or PM, if required). Maximum delay is 23 hours 59 minutes from current time.
 - After 3 seconds "> Press **ENTER** to Confirm" displays
 - After 12 seconds audio prompt - sounds

DISPLAY RESPONSE

| | | |
|--------------------|---------|----------|
| A | Delayed | 1154 hrs |
| RATE | 0 ml/hr | |
| VTBI | _____ | |
| Duration | _____ | |
| START TIME | _____ | |
| Callback Alert? | No | |
| > Enter Rate Value | | |

Channel Information Display:

NO CHANGE

Central Information Display:

- RATE is highlighted
- Last entered rate or "0" displays

Channel Information Display:

NO CHANGE

Central Information Display:

- New rate value displays

Channel Information Display:

NO CHANGE

Central Information Display:

- VTBI is highlighted
- Last VTBI value or "0" displays

Channel Information Display:

NO CHANGE

Central Information Display:

- New VTBI value displays

Channel Information Display:

NO CHANGE

Central Information Display:

| | | |
|--------------------|----------|----------|
| A | Delayed | 1154 hrs |
| RATE | 50 ml/hr | |
| VTBI | 250 ml | |
| START TIME | _____ | hrs |
| Callback Alert? | No | |
| > Enter Start Time | | |

Channel Information Display:

NO CHANGE

Central Information Display:

- New Start Time displays

ACTION/PROMPT

11. Press **ENTER** to change Callback Alert option.
 - Use **↑** or **↓** to select "Yes" (No is default setting) then press **ENTER** to confirm.
 - After 3 seconds "> Press **START**" displays.
 - After 12 seconds audio prompt - sounds.

NOTE

Callback is an audio alert sounding at completion of a Delayed Start Infusion.

12. Attach the set to the patient's vascular access device following accepted hospital procedure.
13. Press **START**.

When START TIME = Current time

- Infusion Starts

When the infusion is complete

- Infusion Stops (No KVO)
- If Callback Alert was selected, an audio alert sounds

DISPLAY RESPONSE

Channel Information Display:
NO CHANGE

Central Information Display:

| | | |
|----------------------|------|--|
| A Delayed | | 1154 hrs |
| RATE | 50 | ml/hr |
| VTBI | 250 | ml |
| START TIME | 1200 | hr |
| Callback Alert? >>> | | <input type="button" value="No"/> <input checked="" type="button" value="Yes"/> |
| > Press START | | |

Channel Information Display:

- Rate display shows "-----"
- STANDBY indicator - illuminates
- Channel indicator - extinguishes

Central Information Display:

| | | |
|-------------|------------------|----------|
| imed | | 1154 hrs |
| A | Start = 1200 hrs | |
| B | VTBI = 500 ml | |
| | | |
| | | |

Channel Information Display:

- Programmed rate displays
- INFUSING indicator - flashes

Central Information Display:

- Active infusion screen displays including Time-of-Day display
- VTBI decrements

Channel Information Display:

- Channel indicator - extinguishes
- Rate display - blanks
- "DELAYED START COMPLETE" scrolls

Central Information Display:

| | | |
|-------------|----------|----------|
| imed | | 1600 hrs |
| A | COMPLETE | |
| B | ----- | |
| | | |
| | | |

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ACTION/PROMPT

DISPLAY RESPONSE

To Set Up a Delayed Start Secondary Infusion

Since by definition, a Delayed Start infusion will not be infusing for a programmed period of time, it is assumed that another infusing IV line will keep the vein open until the delayed start infusion begins. No KVO (Keep Vein Open) infusion precedes or follows completion of the primary infusion in a Delayed Start Secondary infusion.

1. Prime and load the primary administration set as previously described.

2. Press **A** or **B** to select channel.

- "Enter Rate Value" displays after 3 seconds.
- After 12 seconds audio prompt - sounds

3. Press **OPTIONS** **EDIT**.

- After 3 seconds "> Press 1-5 or **↑** or Cancel" displays
- After 12 seconds audio prompt - sounds

4. Press **1**.

- After 3 seconds "> Enter Rate Value" displays
- After 12 seconds audio prompt - sounds

Channel Information Display:

- Channel indicator - illuminates
- RATE display shows "----".

Central Information Display:

- Infusion Setup screen displays

Channel Information Display:

NO CHANGE

Central Information Display:

| | |
|-----------------------------------|------------------------|
| A | Chan Options 1 of 2 |
| 1 | Delayed Start |
| 2 | Drug Calculation Setup |
| 3 | Pressure History |
| 4 | Pressure Limits - P |
| 5 | Stop Infusion |
| > Press 1-5 or ↑ or Cancel | |

Channel Information Display:

NO CHANGE

Central Information Display:

| | | |
|--------------------|------------------|---------|
| A | Delayed | 1430hrs |
| RATE | 0 ml/hr | |
| VTBI | WAVE OPEN DRAIN | |
| START TIME | PACED OPEN DRAIN | |
| Callback Alert? No | | |
| > Enter Rate Value | | |

NOTE

If this is the first Delayed Start (or Multidose) Setup following POWER ON, the following pop-up display appears:

If the time displayed in the upper right corner of the display is correct, press **ENTER** to continue. If the time displayed is incorrect press **OPTIONS** **EDIT**. The following pop-up display appears:

Enter the correct Time of Day and press **ENTER**.

Confirm Current Time

1430 hrs

Press ENTER to confirm.
Press OPTIONS to edit.

Current Time

1430 hrs

ACTION/PROMPT

DISPLAY RESPONSE

NOTE

A Delayed Start Secondary infusion may also be programmed by entering the Primary infusion parameters, press **SEC** and enter the Secondary parameters then press **SEC** and select Option #1 to select Delayed Start Secondary.

5. Press **RATE**.
 - After 3 seconds "> Enter Rate Value" displays
 - After 12 seconds audio prompt - sounds
6. Use numeric data entry or **↑** **↓** controls to input or change rate value
 - After 3 seconds "> Enter VTBI Value" displays
 - After 12 seconds audio prompt - sounds
7. Press **VTBI**.
 - After 3 seconds "> Enter VTBI Value" displays
 - After 12 seconds audio prompt - sounds
8. Use numeric data entry controls to input or change VTBI value
 - After 3 seconds "> Enter Start Time" displays
 - After 12 seconds audio prompt - sounds
9. Press **SEC**.
 - After 3 seconds "> Enter Rate Value" displays
 - After 12 seconds audio prompt - sounds
 - The Rate field is highlighted

Channel Information Display:
NO CHANGE
Central Information Display:
• RATE is highlighted
• Last entered rate or "0" displays

Channel Information Display:
NO CHANGE
Central Information Display:
• New rate value displays

Channel Information Display:
NO CHANGE
Central Information Display:
• VTBI is highlighted
• Last VTBI value or "0" displays

Channel Information Display:
NO CHANGE
Central Information Display:

| | | |
|--------------------|-----------|----------|
| A Delayed | | 1430 hrs |
| RATE | 125 ml/hr | |
| VTBI | 500 ml | |
| START TIME | _____ hrs | |
| Callback Alert? | No | |
| > Enter Start Time | | |

Channel Information Display:
NO CHANGE
Central Information Display:

| | | |
|--------------------|-------------------|----------|
| A Delay SEC | | 1430 hrs |
| PRI | SEC | |
| RATE | 125 _____ 0 ml/hr | |
| VTBI | 500 _____ ml | |
| START TIME | _____ hrs | |
| > Enter Rate Value | | |

NOTE

If the Volume/Time infusion option is enabled, the Delayed Start Secondary set up screen will include a "Duration" parameter displayed between VTBI and START TIME as shown below:

PC-2TX

ACTION/PROMPT

The duration parameter is calculated based upon rate and VTBI parameter inputs. A duration value can not be entered directly in the Delayed Start Secondary mode.

10. Use numeric data entry or **↑** **↓** controls to enter Secondary rate value.
 - After 3 seconds "> Enter VTBI Value" displays
 - After 12 seconds audio prompt - sounds
11. Press **VTBI**.
 - After 3 seconds "> Enter VTBI Value" displays
 - After 12 seconds audio prompt - sounds
12. Use numeric data entry controls to enter Secondary VTBI value.
 - After 3 seconds "> Enter Start Time" displays
 - After 12 seconds audio prompt - sounds
13. Press **TIME** or **ENTER** control.
 - After 3 seconds "> Enter Start Time" displays
 - After 12 seconds audio prompt - sounds
14. Use numeric data entry controls to enter Start Time (Use **↑** **↓** to select AM or PM , if appropriate).
 - After 3 seconds "> Press **START**" displays
 - After 12 seconds audio prompt - sounds

DISPLAY RESPONSE

| | | |
|--------------------|------------|----------|
| A Delay SEC | | 1430 hrs |
| PRI | SEC | |
| RATE | 125 | 0 ml/hr |
| VTBI | 500 | ml |
| Duration | | |
| START TIME | | hrs |
| > Enter Rate Value | | |

Channel Information Display:
NO CHANGE
Central Information Display:
• New Secondary rate displays

Channel Information Display:
NO CHANGE
Central Information Display:
• VTBI is highlighted

Channel Information Display:
NO CHANGE
Central Information Display:

| | | |
|--------------------|------------|-----------|
| A Delay SEC | | 1430 hrs |
| PRI | SEC | |
| RATE | 125 | 100 ml/hr |
| VTBI | 500 | 50 ml |
| START TIME | | hrs |
| > Enter Start Time | | |

Channel Information Display:
NO CHANGE
Central Information Display:

| | | |
|--------------------|------------|-----------|
| A Delay SEC | | 1430 hrs |
| PRI | SEC | |
| RATE | 125 | 100 ml/hr |
| VTBI | 500 | 50 ml |
| START TIME | | hrs |
| > Enter Start Time | | |

Channel Information Display:

| | | |
|----------------------|------------|-----------|
| A Delay SEC | | 1430 hrs |
| PRI | SEC | |
| RATE | 125 | 100 ml/hr |
| VTBI | 500 | 50 ml |
| START TIME | | 1500 hrs |
| > Press START | | |

ACTION/PROMPT

15. Press **START**.

DISPLAY RESPONSE

Channel Information Display:

- Rate display shows "-----"
- STANDBY indicator illuminates
- Channel indicator - extinguishes

Central Information Display:

| | |
|---------------------------|------------|
| imed | |
| A Start = 1500 hrs | SEC |
| B ----- | |
| | |

When START TIME = Current time

- Secondary infusion Starts

Channel Information Display:

- Programmed rate displays
- INFUSING indicator - flashes

Central Information Display:

- Active infusion screen displays including Time-of-Day display
- Secondary VTBI decrements

When the Secondary Infusion is complete

- Switchover audio (6 beeps) sounds (unless disabled in System Configuration)
- Primary infusion begins

Channel Information Display:

- Primary rate displays
- Message screen clears

Central Information Display:

| | |
|------------------------|------------|
| imed | |
| A VTBI = 500 ml | PRI |
| B ----- | |
| | |

WARNING

The Multidose feature is to be used only by personnel properly trained in using multidose containers. Caution labels which clearly differentiate single dose and multidose containers must be utilized. Single dose piggyback systems employing check valve sets are not designed for use with multidose containers.

To Set Up a Multidose Infusion

NOTE

Since by definition, a Multidose infusion will not be infusing for a programmed period of time, it is assumed that another infusing IV line will keep the vein open until the beginning of the first dose and between subsequent doses. No KVO (Keep Vein Open) infusion precedes or follows a Multidose infusion program.

1. Prime and load the primary disposable administration set as previously described.

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ACTION/PROMPT

2. Press **A** or **B** to select channel.
 - After 3 seconds "> Enter Rate Value" displays
 - After 12 seconds audio prompt - sounds
3. Press **OPTIONS EDIT**.
 - After 3 seconds "> Press 1-5 or **↑** or Cancel" displays
 - After 12 seconds audio prompt - sounds
4. Use **↑** **↓** to select screen 2 of 2 of the Channel Options display.
 - After 3 seconds "> Press 1-5 or **↑** or Cancel" displays
 - After 12 seconds audio prompt - sounds
5. Press **1**.
 - After 3 seconds "> Enter Rate Value" displays
 - After 12 seconds audio prompt - sounds

NOTE

If this is the first Multidose (or Delayed Start) Setup following POWER ON, the following pop-up display appears:

If the time displayed in the upper right corner of the display is correct, press **ENTER** to continue. If the time displayed is incorrect press **OPTIONS EDIT**. The following pop-up display appears:

Enter the correct Time of Day and press **ENTER**.

DISPLAY RESPONSE

Channel Information Display:

- Channel indicator - illuminates
- RATE display shows "----".

Central Information Display:

- Infusion Setup screen displays

Channel Information Display:

NO CHANGE

Central Information Display:

| | |
|-----------------------------------|------------------------|
| A Chan Options 1 of 2 | |
| 1 | Delayed Start |
| 2 | Drug Calculation Setup |
| 3 | Pressure History |
| 4 | Pressure Limits - P |
| 5 | Stop Infusion |
| > Press 1-5 or ↑ or Cancel | |

Channel Information Display

NO CHANGE

Central Information Display:

| | |
|-----------------------------------|---------------|
| A Chan Options 2 of 2 | |
| 1 | Multidose |
| 2 | ----- |
| 3 | ----- |
| 4 | ----- |
| 5 | Stop Infusion |
| > Press 1-5 or ↑ or Cancel | |

Channel Information Display:

NO CHANGE

Central Information Display:

| | | |
|--------------------|-----------|----------|
| A | Multidose | 1754 hrs |
| Rate: | --- | 0 ml/hr |
| VTBI/Dose: | --- | --- |
| Interval: | --- | --- |
| # Doses: | --- | --- |
| Start At: | --- | --- |
| > Enter Rate Value | | |

Confirm Current Time



1754 hrs

Press ENTER to confirm.
Press OPTIONS to edit.

Current Time

1754 hrs

ACTION/PROMPT

6. Use numeric data entry or   controls to enter the rate at which each dose is to be infused.
 - After 3 seconds "> Press **ENTER** to confirm" displays
 - After 12 seconds audio prompt - sounds
7. Press **ENTER** or **VTBI**.
 - After 3 seconds "> Enter VTBI Value" displays
 - After 12 seconds audio prompt - sounds

8. Use numeric data entry controls to enter the VTBI/Dose for each dose to be infused.
 - After 3 seconds "> Press **ENTER** to confirm" displays
 - After 12 seconds audio prompt - sounds

NOTE

When an Empty Container Detector (ECD) is connected to the channel, a dialog box questions if last DOSE is to be delivered until container is empty (All).

9. Press **ENTER**.
 - After 3 seconds "> Enter Dose Interval" displays
 - After 12 seconds audio prompt - sounds

10. Use numeric data entry controls to enter the Dose Interval (1-24 hours) for each dose to be infused.
 - After 3 seconds "> Press **ENTER** to confirm" displays
 - After 12 seconds audio prompt - sounds

DISPLAY RESPONSE

Channel Information Display:
NO CHANGE
Central Information Display:
• Rate displays

Channel Information Display:
NO CHANGE
Central Information Display:

| | | |
|--------------------|------------------|-----------------|
| A | Multidose | 1754 hrs |
| Rate: | 100 ml/hr | |
| VTBI/Dose: | 0 ml | |
| Interval: | --- | |
| # Doses: | --- | |
| Start At: | --- | |
| > Enter VTBI Value | | |

Channel Information Display:
NO CHANGE
Central Information Display:
• VTBI/Dose displays

Channel Information Display:
NO CHANGE
Central Information Display:

| | | |
|-----------------------|------------------|-----------------|
| A | Multidose | 1754 hrs |
| Rate: | 100 ml/hr | |
| VTBI/Dose: | 50 ml | |
| Interval: | every_0 hrs | |
| # Doses: | --- | |
| Start At: | --- | |
| > Enter Dose Interval | | |

Channel Information Display:
NO CHANGE
Central Information Display:
• Dose Interval displays

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ACTION/PROMPT

11. Press **ENTER**.
- After 3 seconds "> Enter Number of Doses" displays
 - After 12 seconds audio prompt - sounds

NOTE

Maximum allowable Multidose delivery schedule (number of doses times interval) is 24 hours.

12. Use numeric data entry controls to enter the Number of Doses (1-24) to be infused.
- After 3 seconds "> Press **ENTER** to confirm" displays
 - After 12 seconds audio prompt - sounds

13. Press **ENTER**.
- After 3 seconds "> Enter Start Time" displays
 - After 12 seconds audio prompt - sounds

14. Use numeric data entry controls to enter Start Time (Current time + 8 hours maximum) for initial dose (use **↑** or **↓** to select AM or PM, if required).
- After 3 seconds "> Press **ENTER** to confirm" displays
 - An audio prompt sounds after 12 seconds

NOTE

To start a multidose infusion immediately, enter the current time, as the start time.

15. Press **ENTER**.
- After 3 seconds "> Press **START**" displays
 - After 12 seconds audio prompt - sounds

NOTE

To edit the multidose infusion parameters, press **RATE** to return to the top of the multidose setup screen. Use numeric data entry controls to change highlighted parameter. Use **ENTER** to move to the next parameter.

DISPLAY RESPONSE

Channel Information Display:
NO CHANGE

Central Information Display:

| | | |
|-------------------------|------------------|-----------------|
| A | Multidose | 1754 hrs |
| Rate: | 100 ml/hr | |
| VTBI/Dose: | 50 ml | |
| Interval: | 6 hrs | |
| # Doses: | 0 doses | |
| Start At: | | |
| > Enter Number of Doses | | |

Channel Information Display:
NO CHANGE

Central Information Display:

- Number of Doses displays

Channel Information Display:
NO CHANGE

Central Information Display:

| | | |
|--------------------|------------------|-----------------|
| A | Multidose | 1754 hrs |
| Rate: | 100 ml/hr | |
| VTBI/Dose: | 50 ml | |
| Interval: | 6 hrs | |
| # Doses: | 4 doses | |
| Start At: | | |
| > Enter Start Time | | |

Channel Information Display:
NO CHANGE

Central Information Display:

- Start Time displays

Channel Information Display:
NO CHANGE

Central Information Display:

| | | |
|----------------------|------------------|-----------------|
| A | Multidose | 1754 hrs |
| Rate: | 100 ml/hr | |
| VTBI/Dose: | 50 ml | |
| Interval: | 6 hrs | |
| # Doses: | 4 doses | |
| Start At: | 2000 hrs | |
| > Press START | | |

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ACTION/PROMPT

DISPLAY RESPONSE

- Press **ENTER** to reset and resume same Multidose infusion or press **CHANNEL OFF** to shut down channel.
 - To resume - reset start time

Central Information Display:

| | | |
|----------------------------------|------------------|-----------------|
| A | Multidose | 1600 hrs |
| Rate= 100 ml/hr | | |
| VTBI= 50 ml | | |
| Every 6 hrs x 4 doses | | |
| Doses completed= 4 | | |
| MULTIDOSE COMPLETE | | |
| > Press ENTER to Continue | | |

Channel Information Display:

NO CHANGE

Central Information Display:

ENTER Option

- Multidose infusion program screen displays

CHANNEL OFF Option

| | | |
|--------------------------------------|------------------|-----------------|
| A | Multidose | 1600 hrs |
| Rate: 100 ml/hr | | |
| Retain Infusion Program? | | |
| Press ENTER to retain program | | |
| Press OFF to clear program | | |
| Start At: 2000 hrs | | |
| > Press STOP OFF ENTER | | |

- Press **ENTER** to save Multidose Infusion Program or press **CHANNEL OFF** to clear program.

Channel Information Display:

- Channel displays - blank

Central Information Display:

- Active Infusion screen displays, if the other channel is operating; or the Powerdown screen displays

To Use Drug Calculation

WARNING

The Drug Calculation feature is to be used only by personnel properly trained in the administration of continuously infused medications. Extreme caution should be exercised to insure correct entry of drug calculation infusion parameters. Refer to specific drug product labeling for information concerning appropriate administration techniques and dosages.

- Prime and load the primary disposable administration set as previously described.
- Press **A** or **B** to select channel.
 - After 3 seconds "Enter Rate Value" displays
 - After 12 seconds audio prompt - sounds

Channel Information Display:

- Channel indicator - illuminates
- RATE display shows "----".

Central Information Display:

- Infusion Setup screen displays

ACTION/PROMPT

16. Attach the set to the patient's vascular access device following accepted hospital procedure.
17. Confirm the dosing parameter entries, then press **START**.

DISPLAY RESPONSE

Channel Information Display:

IMMEDIATE START OF MULTIDOSE

- INFUSING indicator - flashes
- Set Rate is displayed

DELAYED START OF MULTIDOSE

- Channel indicator - extinguishes
- STANDBY indicator - illuminates
- Rate display shows "----"

Central Information Display:

| | |
|----------------------------|----------|
| imed | 1800 hrs |
| ★ A DOSE1= 2000 hrs | |
| ★★ B VTBI= 25 ml | |
| | |
| | |

★ Delayed start
★★ Immediate start

When a Multidose infusion is in progress:

- Following completion of a dose infusion, DOSE"X"=(START TIME) displays (where X = number of next dose followed by its scheduled start time)
- The VTBI for an active dose infusion decrements
- To review the selected multidose infusion, press **A** or **B** to call up the selected channel multidose status summary screen.

Central Information Display:

| | |
|------------------------|----------|
| A Multidose | 2230 hrs |
| Rate= 100 ml/hr | |
| VTBI= 50 ml | |
| Every 6 hrs x 4 doses | |
| Doses completed= 1 | |
| Dose 2 Starts 0200 hrs | |
| > Press START | |

When the multidose infusion is completed:

- The infusion stops (with no KVO).

Channel Information Display:

- INFUSING indicator - extinguishes
- Rate display - blanks
- "MULTIDOSE COMPLETE" scrolls

Central Information Display:

- "COMPLETE" displays for the appropriate channel

1. Press **A** or **B** to select channel.

- After 3 seconds "> Press **ENTER** to continue" displays
- After 12 seconds audio prompt - sounds

Channel Information Display:

- Channel indicator - illuminates

ACTION/PROMPT

DISPLAY RESPONSE

3. Press **OPTIONS**.

- After 3 seconds "> Press 1-5 or **↑** or Cancel" displays
- After 12 seconds audio prompt - sounds

Channel Information Display:

NO CHANGE

Central Information Display:

| | |
|-----------------------------------|------------------------|
| A Chan Options 1 of 2 | |
| 1 | Delayed Start |
| 2 | Drug Calculation Setup |
| 3 | Pressure History |
| 4 | Pressure Limits - P |
| 5 | Stop Infusion |
| > Press 1-5 or ↑ or Cancel | |

4. Press **2**.

- After 3 seconds "> Enter Drug Amount" displays
- After 12 seconds audio prompt - sounds

Channel Information Display:

NO CHANGE

Central Information Display:

| | |
|---------------------------|-------------------|
| A Drug Calculation | |
| Amount: _____ | 0 mcg |
| Diluent: _____ | mg |
| Weight: _____ | gram |
| Time Unit: _____ | units |
| [Conc] _____ | ↑ ↓ |
| > Enter Drug Amount | |

5. Use numeric data entry controls to enter the amount of drug added to the IV container.

- After 3 seconds "> Select Unit of Measure" displays
- Use **↑** or **↓** to select a unit of measure (mcg, mg, gram or units)
- After 3 seconds "> Press **ENTER** to confirm" displays
- After 12 seconds audio prompt - sounds

Channel Information Display:

NO CHANGE

Central Information Display:

- Selected Amount displays

6. Press **ENTER**.

- After 3 seconds "> Enter Diluent Volume" displays
- After 12 seconds audio prompt - sounds

Channel Information Display:

NO CHANGE

Central Information Display:

| | |
|---------------------------|------|
| A Drug Calculation | |
| Amount: 400 | mg |
| Diluent: _____ | 0 ml |
| Weight: _____ | |
| Time Unit: _____ | |
| [Conc] _____ | |
| > Enter Diluent Volume | |

7. Use numeric data entry controls to enter the Diluent Volume (when originally prepared)

- After 3 seconds "> Press **ENTER** to confirm" displays
- After 12 seconds audio prompt - sounds

Channel Information Display:

NO CHANGE

Central Information Display:

- Diluent Volume displays

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ACTION/PROMPT

8. Press **ENTER**.
- After 3 seconds "> Dose based on Pt Wt?" displays
 - After 12 seconds audio prompt - sounds

9. Use **↑** or **↓** to select Yes or No in response to query "Dose based on Pt Wt?"
- After 3 seconds "> Press **ENTER** to confirm" displays
 - After 12 seconds audio prompt - sounds

10. Press **ENTER** to confirm selection.
- If Yes is selected, use numeric data entry controls to enter patient weight in kilograms (kg) and press **ENTER** to confirm.
- or
- If No is selected, press **ENTER** to confirm (screen will show "Weight: Not used")
 - After 3 seconds "> Select Time Units" displays

11. Use **↑** or **↓** to select Min or Hour.
- After 3 seconds "> Press **ENTER** to confirm" displays
 - After 12 seconds audio prompt - sounds

DISPLAY RESPONSE

Channel Information Display:
NO CHANGE

Central Information Display:

| | |
|---------------------------|-------------|
| A Drug Calculation | |
| Amount: | 400 mg |
| Diluent: | 250 ml |
| Weight: | > > > > > |
| Time Unit: | ----- |
| [Conc] | 1600 mcg/ml |
| > Dose based on Pt Wt? | |

Channel Information Display:
NO CHANGE

Central Information Display:

- Yes or No selection is highlighted

NOTE

Do not enter a patient weight if weight is not used in the calculation. If setting up a second Drug Calculation also using patient weight, changing weight on one channel recalculates dosage (not infusion rate) on the other channel. When dialog box appears, press **ENTER** to confirm weight for both channels.

Channel Information Display:
NO CHANGE

Central Information Display:

| | |
|---------------------------|-------------|
| A Drug Calculation | |
| Amount: | 400 mg |
| Diluent: | 250 ml |
| Weight: | 80 kg |
| Time Unit: | > > > > > |
| [Conc] | 1600 mcg/ml |
| > Select Time Units | |

Channel Information Display:
NO CHANGE

Central Information Display:

- Min or Hour is highlighted

ACTION/PROMPT

12. Press **ENTER** to confirm selection.

- After 3 seconds "> Press **ENTER** **CANCEL**" displays
- After 12 seconds audio prompt - sounds

DISPLAY RESPONSE

Channel Information Display:

NO CHANGE

Central Information Display:

| | |
|----------|---|
| A | Drug Calculation |
| Amount: | 400 mg |
| D | Drug will be dosed in: |
| V | mcg/kg/min |
| T | Press ENTER to accept, or Press OPTIONS/EDIT to edit |
| [Conc] | 1600 mcg/ml |
| > Press | ENTER CANCEL |

NOTE

Drug dose units default values are delineated in the following table:

| Drug amount entered as: | Drug will be dosed in: | Example: |
|---|------------------------|---|
| micrograms | micrograms | 500 mcg in 50 ml, Weight = no, Time units = Min [Conc] = 10 mcg/ml Drug dose is mcg/min |
| milligrams (where concentration is ≤ 10 mg/ml) | micrograms | 500 mg in 50 ml, Weight = yes, Time units = Min [Conc] = 10000 mcg/ml Drug dose is mcg/kg/min |
| milligrams (where concentration is > 10 mg/ml) | milligrams | 1000 mg in 50 ml, Weight = yes, Time units = Min [Conc] = 20 mg/ml Drug dose is mg/kg/min |
| grams | milligrams | 2 gm in 250 ml, Weight = no, Time units = min [Conc] = 8 mg/ml Drug dose is mg/min |
| units (where concentration is ≥ 1 unit/ml) | units | 25000 units in 250 ml, Weight = no, Time units = Hour, [Conc] = 100 units/ml Drug dose is units/hour |
| units (where concentration is < 1 unit/ml) | milliunits | 10 units in 1000 ml, Weight = no, Time units = Min, [Conc] = 10 milliunits/ml Drug dose is milliunits/min |

If the default drug dose unit does not meet the requirement for the drug to be infused, press the **OPTIONS EDIT** control and use the **↑** **↓** controls to select an alternate drug dosing unit. Press **ENTER** to confirm.

13. Press **ENTER** to confirm the drug calculation dosing parameters or press **CANCEL** to edit drug calculation parameters.

- After 3 seconds "> Enter Rate or Dose" displays
- After 12 seconds audio prompt - sounds

Channel Information Display:

NO CHANGE

Central Information Display:

| | |
|----------------------|-----------------------|
| A | Infusion Setup |
| RATE | ___ 0 ml/hr |
| VTBI | _____ |
| DOSE | 0 mcg/kg/min |
| [Conc] | 1600 mcg/ml |
| > Enter Rate or Dose | |

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ACTION/PROMPT

14. Press **RATE** or **DOSE**.
 - If rate, after 3 seconds "> Enter Rate Value" displays
 - or
 - If dose, after 3 seconds "> Enter Dose Value" displays
 - After 12 seconds audio prompt - sounds
15. Use numeric data entry or controls to enter either a rate or dose (**↑** **↓** can be used to enter rate).
 - After 3 seconds "> Enter VTBI Value" displays
 - After 12 seconds audio prompt - sounds
16. Press **VTBI**.
 - After 3 seconds "> Enter VTBI Value" displays
 - After 12 seconds audio prompt - sounds
17. Use numeric data entry controls to enter VTBI value.
 - After 3 seconds "> Press **START**" displays
 - After 12 seconds audio prompt - sounds
18. Attach the set to the patient's vascular access device following accepted hospital procedure.
19. Press **START**.

During the infusion

- Changes made to the rate result in corresponding changes to the drug dose.
- Changes made to the dose result in corresponding changes to the rate.

Stopping and saving a Drug Calculation Infusion:

1. Press **A** or **B** to select channel.
 - After 3 seconds "> Enter VTBI Value" displays
 - After 12 seconds audio prompt - sounds

DISPLAY RESPONSE

Channel Information Display:

NO CHANGE

Central Information Display:

- If rate, RATE and 0 ml/hr are highlighted

or

If dose, DOSE and 0 ^{mcg/kg/min} are highlighted

Channel Information Display:

NO CHANGE

Central Information Display:

- Entered Rate value and calculated Dose value are displayed

or

Entered Dose value and calculated Rate display

Channel Information Display:

NO CHANGE

Central Information Display:

- VTBI and 0 ml are highlighted

Channel Information Display:

NO CHANGE

Central Information Display:

| A Infusion Setup | |
|----------------------|----------------|
| RATE | 10.0 ml/hr |
| VTBI | 250 ml |
| DOSE | 3.3 mcg/kg/min |
| [Conc] | 1600 mcg/ml |
| > Press START | |

Channel Information Display:

- Channel indicator - extinguishes
- INFUSING indicator - flashes
- Selected or calculated rate displays
- Selected or calculated dose scrolls

Central Information Display:

- Active infusion screen displays

Channel Information Display:

- Drug dose continues to scroll (unless drug dose display is set to "Temporary" in System Configuration)

Central Information Display:

- VTBI value decrements

Channel Information Display:

- Channel indicator - illuminates

Central Information Display:

- Drug Calculation Infusion Setup screen displays

ACTION/PROMPT

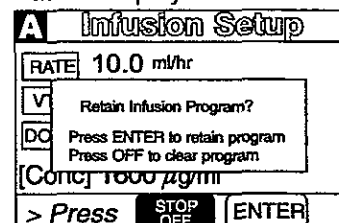
2. Press .

DISPLAY RESPONSE

Channel Information Display:

- Rate display - blanks
- INFUSING indicator - extinguishes

Central Information Display:




A Infusion Setup

RATE 10.0 ml/hr

V Retain Infusion Program?

DC Press ENTER to retain program
Press OFF to clear program

[Conc] 1000 µg/ml

> Press  ENTER

3. Press  to save Drug Calculation Infusion Program or press  to clear program.

Channel Information Display:

- Channel displays - blank

Central Information Display:

- Active Infusion screen displays, if the other channel is operating; or Powerdown screen displays

To Edit a Drug Calculation Setup

WARNING

It is the responsibility of the user to adjust infusion rate, if required. Changing drug concentration (e.g. switching to a higher drug concentration) may require adjustment of the infusion rate. Use accepted hospital procedure which may involve changing IV tubing or repriming existing tubing when drug concentration is changed.

Editing the setup parameters during a running drug calculation will result in a recalculation of the dosage. Rate will remain as programmed.

If Amount, Diluent or Time Unit parameters are changed, the following dialog box appears:

Drug concentration change recalculates dose. Rate remains as programmed. Adjust Rate/Dose if required. Re-prime line if necessary.

Press Enter to continue

If only weight is changed, the following dialog box appears:

Note: Weight change does not change rate. Dose recalculates based on new weight. Adjust Dose or Rate if required.

Press Enter to continue

PC-2TX

ACTION/PROMPT

DISPLAY RESPONSE

Changing Channel Selection Before Completing Programming

NOTE

Prior to completing a program change, it is possible to exit one channel and program the other. Upon starting the second channel, the previous channel is automatically selected along with a dialog box that alerts the user to complete the program change.

Channel A or B's program has been changed.

Press ENTER to complete confirm

or

Press CANCEL to clean program

To Infuse Using an Empty Container Detector (ECD)

1. Set up a primary infusion on any channel.
2. Connect an ECD to the appropriate ECD connector on the rear panel of the PC-2TX.
 - The appropriate channel indicator LED on the ECD will illuminate.
3. Attach the ECD to the drip chamber of the primary set.
4. Press **VTBI**, then **0** or **CLEAR** to clear the VTBI value.
5. Press **1**, to select "ALL" or program a specific VTBI using the numeric data entry controls.

Central Information Display:

| | |
|-------------------------|-----------|
| A Infusion Setup | |
| RATE | 125 mL/hr |
| VTBI | ALL |
| > Press START | |

6. Press **START**.

When the ECD senses an empty container:

- An audio prompt sounds
- "EMPTY CONTAINER-KVO" scrolls
- RATE display shows "1" or set rate if <1.0
- Channel ALARM indicator - flashes
- Channel INFUSING indicator - continues to flash.

ACTION/PROMPT

DISPLAY RESPONSE

To Select Anesthesia Mode

NOTE

Anesthesia mode is intended for use in the operating room where critical IV infusions are under constant surveillance by anesthesia personnel. Anesthesia mode allows the user to PAUSE an infusion with no audible prompting or "walkaway" alarms associated with normal PC-2TX operation. It also decreases the number of steps required to restart a saved Drug Calculation program. Anesthesia mode must be enabled in the System Configuration in order to be selected.

1. Power on the PC-2TX as previously described.

2. Press .

Central Information Display:

| | |
|------------------------|----------------------|
| imed System Options | |
| 1 | Display Contrast |
| 2 | Time-of-Day |
| 3 | Anesthesia Mode |
| 4 | Computer Control |
| 5 | System Configuration |
| > Press CANCEL to Exit | |



NOTE



If "Anesthesia Mode" is displayed in half-tone on the Systems Options display, Anesthesia mode has not been enabled. Contact biomedical engineering to enable feature.

3. Press .

- After 3 seconds "> Press ENTER to confirm" displays
- After 12 seconds audio prompt - sounds

Central Information Display:

| | |
|---|---|
| imed Sys Config Edit | |
| Anesthesia Mode Silences audio prompting during the PAUSE mode and decreases the number of steps to confirm and restart an infusion. Automatically cancelled when pump is unplugged. | <div>No</div> <div>Yes</div> <div>   </div> |
| > Press ENTER to confirm | |

4. Use   to select the "Yes" option.
 - "> Press ENTER to Confirm" displays
 - After 12 seconds audio prompt - sounds

Central Information Display

- "Yes" option is highlighted

5. Press .

Central Information Display

- System option screen displays

6. Press .

Central Information Display

- Infusion Setup or Active Infusion screen displays

NOTE

Anesthesia mode is automatically de-selected when the AC power cord is unplugged from AC outlet or the instrument is turned off during battery operation. It can also be de-selected using the procedure described above.

PC-2TX

ACTION/PROMPT

DISPLAY RESPONSE

To Clear Alarms

1. Check the Channel Information Display to determine the type of alarm condition.
2. Refer to the CHANNEL, CENTRAL INFORMATION DISPLAY AND ALARM RESPONSE PROCEDURES section in this manual for the proper procedures for responding to a specific alarm condition.

To Power Off the PC-2TX

1. Press **A** or **B** as appropriate.
2. Press **CHAMED OFF**.
3. Repeat steps 1 and 2 until both channels are stopped.

During the power off sequence:

NOTE

To interrupt the power off sequence, press the PAUSE control prior to the count-down timer in the central information display reaching "1". To resume the infusion, select the appropriate channel, confirm Rate and VTBI, then press START and verify that the channel operating indicator is flashing.

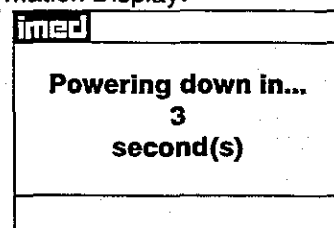
Channel Information Display:

- All displays and indicators for selected channel - extinguish

Central Information Display:

- Selected channel display reverts to unprogrammed status.

Central Information Display:



- Time value decrements from 3 to 1, then the PC-2TX powers down.

3.3.1.4 Monitor or Computer Control Setup and Operating Procedures

The steps necessary to operate the PC-2TX in Monitor or Computer Control Operation are described in the following section.

CAUTION

ONLY equipment that has been qualified to IEC 601-1 standards should be connected to the PC-2TX's RS-232-C Data Port and the connection should **ONLY** be performed by qualified personnel.

To Establish PC-2TX/Host Computer Interface

1. Set computer communication parameters.

NOTE

Before the PC-2TX can be used in the Monitor or Computer Control Operation conditions, the computer communication parameters must be set by hospital technical personnel, both in the host computer and in the PC-2TX. Thorough familiarity with independent operation of the PC-2TX is a prerequisite for technical personnel responsible for configuring the pump/controller for remote operation. The procedures for setting the computer communication parameters for the PC-2TX are provided in this manual. The procedures for setting the computer communication parameters for the host computer are provided in the ALARIS Medical C2 Communications Protocol Programmer's Guide.

2. Connect the communication interface cable to the RS-232-C communication DATA PORT connector (rear panel) of the PC-2TX and to the host computer.

NOTE

Before the PC-2TX can be set up for either Monitor or Computer Control Operation, the communication interface cable must be connected to the RS-232-C communication DATA PORT connector on the rear panel of the PC-2TX. The technical data necessary to interface the host computer interface cable to the PC-2TX's RS-232-C Communication DATA PORT connector is provided in this manual.

When power is then applied to the PC-2TX's circuits, the MONITOR indicator will illuminate.

ACTION/PROMPT

DISPLAY RESPONSE

To Change PC-2TX Operating Condition from Independent to MONITOR

1. Connect the communication interface cable to the RS-232-C communications DATA PORT connector on the rear panel.

The MONITOR indicator illuminates.

To Change PC-2TX Operating Condition from MONITOR to Independent

1. Disconnect the communication interface cable from the RS-232-C communications DATA PORT connector on the rear panel.

The MONITOR indicator extinguishes.

To Change PC-2TX Operating Condition from MONITOR to COMPUTER CONTROL

1. Press .

Central Information Display:

| | |
|------------------------|----------------------|
| Time | System Options |
| 1 | Display Contrast |
| 2 | Time-of-Day |
| 3 | Anesthesia Mode |
| 4 | Computer Control |
| 5 | System Configuration |
| > Press CANCEL to Exit | |

PC-2TX

ACTION/PROMPT

DISPLAY RESPONSE

NOTE

If "Computer Control" is displayed in half-tone on the Systems Options display, Computer Control is not enabled and is not available for use.

2. Press **4**.

- After 3 seconds "> Select Option/Cancel" displays
- After 12 seconds Audio prompt - sounds

Central Information Display:

The screen displays the title "intel Sys Config Edit". Below the title, the text "Computer Control" is shown, followed by "Enable remote computer control of the pump." To the right of this text is a small box with "No" and "Yes" options, with the "Yes" option highlighted. Below the text is a prompt "> Select Option/Cancel".

3. Select "Yes" using the **↑** **↓** controls.

4. Press **ENTER**.

- **COMPUTER CONTROL** and Computer Control indicator - flash
- The PC-2TX keypad is inoperative, except for the **PAUSE** **SILENCE** **VOLUME INFUSED** **OPTIONS EDIT** **CANCEL** **CHANNEL OFF** controls

Central Information Display:

The screen displays the title "intel Computer Control". Below the title, the text "A VTBI = 416 ml" is shown. Below this text is a prompt "> Select Option/Cancel".

To Change PC-2TX Operating Condition from COMPUTER CONTROL TO MONITOR

1. Press **OPTIONS EDIT** or **CANCEL**.

- After 3 seconds "> Select Option/Cancel" displays

Central Information Display:

The screen displays the title "intel Computer Control". Below the title, the text "A VTBI = 416 ml" is shown. Below this text is a box with "Exit Computer Control Mode?" and "No" and "Yes" options, with the "Yes" option highlighted. Below the text is a prompt "> Select Option/Cancel".

2. Select the "Yes" option by using the **↑** **↓** controls.

Central Information Display:

- "Yes" option is highlighted

3. Press **ENTER**.

- Infusions in progress under computer control continue as programmed

Central Information Display:

The screen displays the title "intel". Below the title, the text "A VTBI = 416 ml" is shown. Below this text is a prompt "> Select Option/Cancel".

- **MONITOR** indicator - illuminates

ACTION/PROMPT

DISPLAY RESPONSE

To Power Off the PC-2TX in MONITOR Operation

1. Press **A** or **B** as appropriate.
2. Press **CHANNEL OFF**.
3. Repeat steps 1 and 2 until both channels are stopped.

During the power off sequence:

NOTE

To interrupt the power off sequence, press the PAUSE control prior to the count-down timer in the central information display reaching "1". To resume the infusion, select the appropriate channel, confirm Rate and VTBI, then press START and verify that the channel operating indicator is flashing.

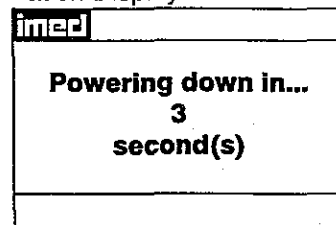
Channel Information Display:

- All displays and indicators for selected channel - extinguish

Central Information Display:

- Selected channel display reverts to unprogrammed status.

Central Information Display:



- Time value decrements from 3 to 1, then the PC-2TX powers down.

To Power Off the PC-2TX in COMPUTER CONTROL Operation

1. Repeat procedure listed above under "To Change PC-2TX Operation from COMPUTER CONTROL to MONITOR."
2. Press **A** or **B** as appropriate.
3. Press **CHANNEL OFF**.
4. Repeat steps 1 and 2 until both channels are stopped.

During the power off sequence:

NOTE

To interrupt the power off sequence, press the PAUSE control prior to the count-down timer in the central information display reaching "1". To resume the infusion, select the appropriate channel, confirm Rate and VTBI, then press START and verify that the channel operating indicator is flashing.

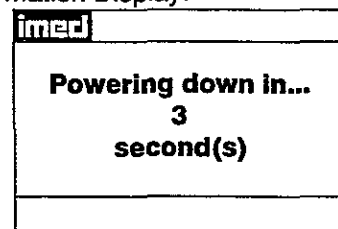
Channel Information Display:

- All displays and indicators for selected channel - extinguish

Central Information Display:

- Selected channel display reverts to unprogrammed status.

Central Information Display:



- Time value decrements from 3 to 1, then the PC-2TX powers down.

PC-2TX

ACTION/PROMPT

DISPLAY RESPONSE

The operating procedures listed below are identical for both MONITOR operation and Independent operation. Refer to the Independent Setup section of this manual for the detailed descriptions.

To Set Up a Primary Infusion with the Volume/Time Infusion Option Enabled
To Adjust Central Information Display Contrast
To Pause an Infusion
To Stop a Primary Infusion
To Change Rate or VTBI During Infusion
To Titrate Rate
To Change the Pressure Limits (PCS Mode control unlocked)
To Restart an Infusion Following an "INFUSION COMPLETE-KVO" or "EMPTY CONTAINER-KVO" Advisory
To View Primary, Secondary and Total Volume Infused on both Channels Simultaneously
To Clear Primary, Secondary and Total Volume on both Channels Simultaneously
To View Primary, Secondary and Total Volume Infused on Selected Channel
To Clear Primary, Secondary and Total Volume Infused on Selected Channel

To Set Up a Secondary (Piggyback) Infusion With Dual Rates
To Set Up a Secondary (Piggyback) Infusion with Dual Rates and The Volume/Time Infusion Option Enabled
To Change Primary Infusion Parameters During a Secondary Infusion
To Stop a Secondary Infusion and Return to the Primary Infusion
To Change the Time of Day
To Set Up a Delayed Start Infusion
To Set Up a Delayed Start Secondary Infusion
To Set Up a Multidose Infusion
To Use Drug Calculation
To Infuse Using an Empty Container Detector (ECD)
To Select Anesthesia Mode
To Clear Alarms

During COMPUTER CONTROL operation, these procedures are performed through the host computer. Appropriate computer control procedures are described in the ALARIS Medical C2 Communications Protocol Programmer's Guide.

3.4 CHANNEL, CENTRAL INFORMATION DISPLAYS AND ALARM RESPONSE PROCEDURES

In the normal operating mode four types of visual displays are presented to the operator: prompts, advisories, alarms and malfunctions. These messages may be scrolled or flashed on the Channel Information message display or presented statically in conjunction with the specific Central Information Display screens.

Table 3-2 lists the Message Displays presented by the PC-2TX, identifies the meaning and defines the recommended operator response.

Table 3-2. Visual Message Displays

ADVISORIES

An **ADVISORY** is a sequence of audio and/or visual signals to advise the user of the operating status of the PC-2TX. The audio may be silenced for approximately two minutes by pressing the SILENCE control.

| Advisory | Meaning | Response |
|---|--|--|
| INFUSION COMPLETE - KVO Audio: prompt Visual: continuous scroll in channel information display | VTBI has been infused; PC-2TX is infusing at KVO rate. | Stop channel, or set up new infusion. |
| EMPTY CONTAINER-KVO Audio: prompt Visual: continuous scroll in channel information display | Empty container detected by ECD before programmed VTBI delivered, or when "ALL" has been used as the VTBI parameter. PC-2TX is infusing at KVO rate. ECD plugged into PC-2TX, but not attached to drip chamber. | Replace IV container, turn off PC-2TX, or set up a new infusion. Attach ECD to drip chamber. |
| DELAYED START COMPLETE Audio: none, unless callback was selected Visual: continuous scroll in channel information display | The delayed start infusion has been infused. | Stop channel or set up a new infusion. |
| MULTIDOSE COMPLETE Audio: none Visual: continuous scroll in channel information display | All doses of the multidose infusion have been infused. | Stop channel or set up a new infusion. |
| LOW BATTERY Audio: prompt Visual: continuous display in central information display | Low battery threshold sensed, remaining battery operational life is limited. | Connect AC power cord to outlet; alarm will be silenced. |
| Maintenance Mode Audio: key click Visual: continuous display in central information display | Instrument powered up in the Maintenance mode. | DO NOT USE ON PATIENT. Check with Biomedical Department. |
| Battery Replacement <div style="border: 1px solid black; padding: 5px; display: inline-block;">Do not use on battery. Operate on AC only. Battery Replacement Required. Contact Biomed.</div> | The pump has detected a battery that is no longer capable of sustaining a charge. | Replace with an operable pump as soon as possible. Send pump to Biomedical department to have battery checked. |



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| Advisory | Meaning | Response |
|--|---|---|
| Replace Battery Audio: On AC - None On DC - Prompt Visual: continuous display in central information display | The pump has detected a battery that is no longer capable of sustaining a charge. | Replace with an operable pump as soon as possible. Send pump to Biomedical department to have battery checked. |
| Paused Audio: advisory, then prompt after 2 minutes Visual: continuous display in central information display | PAUSE control has been pressed. | Press START control to resume infusion, or press CHANNEL OFF to stop infusion. |
| PAUSE Audio: advisory, then prompt after 2 minutes Visual: continuous scroll in channel information display | PAUSE control has been pressed. | Press START control to resume infusion, or press CHANNEL OFF to stop infusion. |
| Panel/Keypad Locked Audio: key click Visual: continuous display for 3 seconds in central information display | Audio control has been pressed and held for 3 seconds to initiate tamper-resistant feature. | None. (Repeat to cancel tamper-resistance). |
| Panel/Keypad Unlocked Audio: key click Visual: continuous display for 3 seconds | Audio control has been pressed and held for 3 seconds to deactivate tamper-resistant feature. | None. (Repeat to re-initiate tamper-resistance). |
| LOW FLOW Audio: advisory Visual: continuous scroll in channel information display | Flow has slowed due to back pressure equalling container height in Controller mode. An occlusion alarm will occur within one minute. | Check tubing for restriction, raise container, press START, or change to pump delivery mode (if P/C mode control unlocked). |
| Start = XX:XX Audio: none Visual: continuous display | Delayed start program initiated. XX:XX is the programmed start time. | None. When current time = start time, the infusion will start. |
| SECONDARY Audio: none Visual: continuous scroll in channel information display | A secondary infusion is in progress on the affected channel. | None. When secondary VTBI = "0", the infusion will revert to the programmed primary parameters. |
| Dose n = XX:XX Audio: none Visual: continuous display | Multidose infusion is either infusing or in standby. Dose n = the sequential number of the next (if in standby) or currently infusing dose. XX:XX is the programmed start time for the next dose. | None. Infusion will proceed as programmed. Press appropriate channel select to review infusion status. |
| Anesthesia Mode-Pause Audio: none Visual: continuous scroll in channel information display | PAUSE control was pressed while Anesthesia mode was selected. | Select channel, then press START to resume or press CHANNEL OFF to stop infusion. |
| Powering down in X second(s) Audio: prompt Visual: Timed display in central information display | The CHANNEL OFF control has been pressed | None. To stop power down, press any control except POWER ON. |

A **PROMPT** is an audio and/or visual signal appearing on the bottom line of the central information display to the user to perform some action. The audio may be silenced for ≈2 minutes by pressing the SILENCE control.

| Prompt | Meaning | Response |
|--|--|---|
| Select Option/Cancel Audio: prompt Visual: continuous display | The OPTIONS/EDIT key was pressed. | Select the appropriate System or Channel option. Press CANCEL to exit menu. |
| 24 Hour Limit Exceeded Audio: prompt Visual: continuous display for 3 seconds | A combination of Time Interval and Number of Doses that would exceed the maximum allowable 24 hour Multidose infusion was entered. | Re-enter an appropriate combination of Time Interval and Number of Doses to result in a total duration of 24 hours or less. |
| Enter Rate Value Audio: prompt Visual: continuous display | Begins following press of POWER ON and CHANNEL SELECT controls, or if START control is pressed with rate set to "0". | Press RATE control and enter rate. |
| Enter VTBI Value Audio: prompt Visual: continuous display | Begins following press of VTBI control, or if START control is pressed with VTBI set to "0". | Press VTBI control and enter VTBI. |
| Press START Audio: prompt Visual: continuous display | Begins approximately 3 seconds after last press of data entry controls if neither parameter is zero, or approximately 12 seconds after an alarm is cleared, or approximately 2 minutes after PAUSE is pressed. | Press START control. |
| Select Channel Audio: prompt Visual: continuous display | Begins when attempt is made to set parameters or start infusion prior to selecting a channel. | Press appropriate CHANNEL SELECT control. |
| Enter All Parameters Audio: prompt Visual: continuous display for 3 seconds | The START control was pressed prior to entering valid parameters. | Follow prompts and enter valid parameters for all data entry fields. |
| Enter Start Time Audio: prompt Visual: continuous display | The TIME control was pressed after entering rate and VTBI parameters. | Press ENTER to confirm the current data entry, and move to the next programming step. |
| Enter Dose Interval Audio: prompt Visual: continuous display | Part of multidosing infusion set up sequence. | Enter the desired dose interval (range 1-24 hours). |
| Enter Duration Audio: prompt Visual: continuous display | Begins after entering VTBI in a Volume/Time infusion | Enter the desired duration of the infusion. |
| Dose Interval too Short Audio: prompt Visual: continuous scroll for 3 seconds | A multidose interval was entered that the pump could not infuse based on the Rate and VTBI/dose setting. | Enter appropriate interval Rate and VTBI/dose setting. |

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| Prompt | Meaning | Response |
|---|--|---|
| Enter Number of Doses Audio: prompt Visual: continuous display | Part of multidosing infusion set up sequence. | Enter the desired number of doses (range 1-24). |
| Enter Drug Amount Audio: prompt Visual: continuous display | Part of drug calculation infusion set up sequence. | Enter the amount of drug added to the IV fluid container. |
| Select Unit of Measure Audio: prompt Visual: continuous display | Part of drug calculation infusion set up sequence. | Select the appropriate units for the drug added to the container (gm, mg, mcg, or units). |
| Enter Diluent Volume Audio: prompt Visual: continuous display | Part of drug calculation infusion set up sequence. | Enter the volume of the drug container in milliliters. |
| Dose Based on Pt. Wt? Audio: prompt Visual: continuous display | Part of drug calculation infusion set up sequence. | Select "Yes" or "No". |
| Enter Patient Weight Audio: prompt Visual: continuous display | Part of drug calculation infusion set up sequence. | Enter patient weight in kilograms (kg). |
| Select Time Units Audio: prompt Visual: continuous display | Part of drug calculation infusion set up sequence. | Select appropriate time interval for drug dosing (minutes or hours). |
| Enter Rate or Dose Audio: prompt Visual: continuous display | Part of drug calculation infusion set up sequence. | Press RATE and enter infusion rate, or press DOSE and enter the desired drug dosage. |
| Max Rate Exceeded Audio: illegal key Visual: continuous display | Flow rate parameters which result in an infusion rate that is out of range have been entered. | Enter appropriate flow rate parameters. |
| Press Enter to Confirm Audio: prompt Visual: continuous display | The current parameter entry(s) must be confirmed to enable proceeding to the next programming step. | Press ENTER. |
| Press 1-5 or  or Cancel | The desired option can be selected by pressing the appropriate selection number or pressing  to move to the next menu screen. | Select desired entry or cancel out. |
| Reenter VTBI value Audio: illegal key Visual: continuous display | A VTBI value of ≥ 1000 mL was entered with a fractional rate value. | Enter a VTBI value < 1000 mL or change rate to a non-fractional value. |
| Enter Dose Value Audio: prompt Visual: continuous display | Dose control was pressed during a Drug Calculation. | Enter the desired medication dose. |
| Dose Interval >24 hours Audio: illegal key Visual: continuous display for 3 seconds | During Multidose setup a dose interval >24 hours was entered. | Enter a dose interval that is <24 hours. |

| Prompt | Meaning | Response |
|---|--|--|
| Dose Interval too Short Audio: illegal key Visual: continuous display for 3 seconds | During a Multidose setup a dose interval was entered that was < dose delivery time. | Enter a dose interval that is \geq VTBI/rate. |
| Invalid Minute Entry Audio: illegal key Visual: continuous display | During a Delayed Start or Multidose setup, a start time or current time entry >59 minutes was selected. | Enter a minute time value ≤ 59 . |
| Invalid Hour Entry Audio: illegal key Visual: continuous display | During a Delayed Start or Multidose setup, a start time or current time of day >23 (military time) was entered. | Enter an hour value ≤ 23 hours (military) or ≤ 11 hours (AM/PM). |
| P/C Mode Locked Audio: illegal key Visual: continuous display for 3 seconds | Channel Option #4 was selected when the P/C Mode was locked. | If P/C Mode change is desired, refer to Section 3.3.1.2 for System Configuration mode operation. |
| Stop Infusion First Audio: illegal key Visual: continuous display | A mode of operation that is incompatible with the current mode of operation was selected from the channel options menu. | Select #5 - stop infusion, to stop the current infusion prior to selecting a different operating mode. |
| Confirm Time-of-Day Audio: prompt Visual: continuous display | Appears the first time a delayed start or multidose infusion is setup following instrument power up. | Confirm that the time-of-day displayed is correct. If not, enter correct time of day. |
| Mode Not Available Audio: illegal key Visual: continuous display for 3 seconds | A selection of a disabled or unavailable option was made from the Channel Options menu. | If disabled option is required, refer to Section 3.3.1.2 for System Configuration mode operation. |
| Use   to adjust Audio: none Visual: continuous display | The display contrast option was selected from the Systems Option menu. | Use the  or  controls to adjust the central information display for optimum viewing, then press ENTER. |
| Max Dose Exceeded Audio: illegal key Visual: continuous display for 3 seconds | In Drug Calculation, a dose that exceeds the display limits was entered. | Enter a lower dose or rate value. Verify correct entry of drug amount and diluent volume. |
| Min Dose Exceeded Audio: illegal key Visual: continuous display for 3 seconds | In Drug Calculation, a dose that is less than the allowable limit was entered. | Enter a higher rate or dose value. Verify correct entry of drug amount and diluent volume. |
| Invalid Dose Audio: illegal key Visual: continuous display for 3 seconds | In Drug Calculation, the patient weight input was changed so significantly that the dose/rate on another channel would be forced out of allowable range. | Enter an appropriate patient weight value. |
| Invalid Rate Audio: illegal key Visual: continuous display for 3 seconds | In Drug Calculation, the patient weight input was changed so significantly that the dose/rate on another channel would be forced out of allowable range. | Enter an appropriate patient weight value. |

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| Prompt | Meaning | Response |
|---|--|---|
| Invalid Rate Audio: illegal key Visual: continuous display for 3 seconds | In Drug Calculation, the patient weight input was changed so significantly that the dose/rate on another channel would be forced out of allowable range. | Enter an appropriate patient weight value. |
| Check Amount and Diluent Audio: illegal key Visual: continuous display for 3 seconds | In Drug Calculation, a combination of drug amount and diluent volume were entered that resulted in an invalid drug concentration. | Enter appropriate drug amount and diluent volume values. |
| Enter Fractional Value Audio: illegal key Visual: continuous display for 3 seconds | During a Secondary infusion setup, a Secondary rate value ≥ 100 mL/hr was entered when the Primary rate was fractional. | Enter a fractional Secondary rate value or change the Primary rate value to a non-fractional value. |
| Delay Mode is Active Audio: illegal key Visual: continuous display for 3 seconds | The Time-of-Day option was selected from the Systems Options menu while a Delayed start or Multidose infusion was active. | Time-of-Day cannot be changed unless all Delayed Start and Multidose infusions are stopped. |
| Channel in KVO Audio: none Visual: continuous display for 3 seconds | An attempt was made to set up a Secondary infusion while the Primary infusion was in KVO. | Reset the Primary rate and VTBI values within the normal operating range. |
| >24 hour Limit Exceeded Audio: illegal key Visual: Continuous display for 3 seconds | A Multidose rate and VTBI/dose that results in an infusion interval >24 hours. | Change rate and/or VTBI values such that the time required for infusion is <24 hours. |
| Press OFF or ENTER Audio: prompt Visual: Continuous display | A Multidose or Drug Calculation infusion has been turned off. Pressing ENTER retains the infusion program; pressing CHANNEL OFF deletes the program. | Press ENTER retains the program; pressing CHANNEL OFF deletes the program and returns the channel to normal operation. |
| Delay Exceeds 8 Hours Audio: illegal key Visual: continuous display for 3 seconds | A start time >8 hours ahead of current time was selected for a Multidose infusion. | Enter a Start Time 8 hours or less ahead of current time-of-day. |
| Press CANCEL to Exit Audio: prompt Visual: continuous display | The Systems Options menu was accessed. | Select an option or press CANCEL to return to the main display menu. |
| Press ENTER to Continue Audio: prompt Visual: continuous display | The channel was selected following a completed Multidose infusion. | To continue the same infusion, press ENTER to gain access to the Multidose infusion setup screen. Enter the desired Start time and press START. |

An **ALARM** is an audio and visual signal to the user that a potentially unsafe condition is present. Immediate action is required. The audio may be silenced except during a "FLO-STOP" OPEN/CLOSE DOOR condition for approximately 2 minutes by pressing the SILENCE control.

| Alarm | Meaning | Response |
|--|---|---|
| CHECK ECD Audio: alarm Visual: Continuous scroll, channel alarm indicator flashes | START control pressed with VTBI set to "ALL" and ECD not connected, or ECD has been disconnected during an "ALL" infusion, or ECD has failed. Infusion stops. | Connect or replace ECD, then press START control. |
| CHECK IV SET Audio: alarm Visual: continuous scroll, channel alarm indicator flashes | Administration set not properly installed. Infusion stops on affected channel. | Close roller clamp, remove and reinstall administration set, close door, open roller clamp. |
| DOOR OPEN Audio: alarm Visual: continuous scroll, channel alarm indicator flashes | Door opened during an infusion. Infusion stops on affected channel. | Close door, press appropriate CHANNEL SELECT control, then press START control. |
| RESTART CHANNEL Audio: alarm Visual: continuous scroll, channel alarm indicator flashes | Door was opened during an infusion and then closed. Infusion stops on affected channel. | Press the appropriate CHANNEL SELECT control, then press START control. |
| AIR-IN-LINE Audio: alarm Visual: continuous scroll, channel alarm indicator flashes | Air has been detected in set during an infusion. Infusion stops on affected channel. | Ensure tubing is properly installed in air-in-line detector. If air is present, clear air from administration set. Press appropriate CHANNEL SELECT control, then press START control. |
| OCCLUDED PATIENT SIDE Audio: alarm Visual: continuous scroll, channel alarm indicator flashes seconds | Increased back pressure sensed while infusing in the pump delivery mode. Infusion stops on affected channel. | Clear occlusion, press appropriate CHANNEL SELECT control, then press START control. |
| OCCCLUSION Audio: alarm Visual: continuous scroll, channel alarm indicator flashes | Occlusion is detected on either fluid or patient side while infusing in controller delivery mode. Infusion on affected channel stops. | Clear occlusion or raise the fluid container. Press the appropriate CHANNEL SELECT control, then press the START control. (If the occlusion recurs, open and close door. Press CHANNEL SELECT and START control.) |
| PARTIAL OCCCLUSION FLUID SIDE Audio: alarm Visual: continuous scroll, channel alarm indicator flashes | Partial upstream occlusion detected while infusing in pump delivery mode. Infusion on affected channel stops. | Remove cause of reduced flow in fluid side of administration set, press appropriate CHANNEL SELECT control, then press START control. |
| OCCCLUSION FLUID SIDE Audio: alarm Visual: continuous scroll, channel alarm indicator flashes | Upstream occlusion sensed while infusing in pump delivery mode. Infusion on affected channel stops. | Clear occlusion in fluid side of administration set, press appropriate CHANNEL SELECT control, then press START control. |

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| Alarm | Meaning | Response |
|---|--|--|
| "FLO-STOP" OPEN/CLOSE DOOR Audio: alarm Visual: continuous scroll, channel alarm indicator flashes | Flo-Stop open (in free-flow position) with door open. | Close roller clamp on set or close door and resume infusion by pressing appropriate CHANNEL SELECT control, then pressing START control. (If alarm occurs when the door is closed, replace PC-2TX with operable unit.) |
| BATTERY DISCHARGED Audio: malfunction Visual: Channel Display: • Low Battery flashes alternately on Channels A and B message displays Central Display: <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> BATTERY DISCHARGED ALL CHANNELS PAUSED PLUG IN TO RESUME OR PRESS OFF TO POWER DOWN </div> | Low battery voltage detected. Infusions on both channels stop. | Connect AC power cord to power source. Press CHANNEL OFF control to turn off the PC-2TX. Press POWER ON, press CHANNEL SELECT, reenter rate and VTBI. Press START to resume the infusion(s). |

A **MALFUNCTION** is a signal to alert the operator that a failure has been detected. Immediate action is required. The audio cannot be silenced without powering off the affected channel(s).

| Malfunction | Meaning | Response |
|---|--|---|
| SYSTEM MALFUNCTION Audio: malfunction Visual: Channel Display: <ul style="list-style-type: none"> Rate displays flash "- - - -" Channel ALARM and STANDBY indicators flash Central Display: <div> <p>For Battery Operation</p> <p>SYSTEM MALFUNCTION ALL CHANNELS STOPPED PRESS CHANNEL OFF TO POWER OFF CODE NUMBER: XXX"</p> </div> <div> <p>For AC Power Operation</p> <p>SYSTEM MALFUNCTION ALL CHANNELS STOPPED PRESS CHANNEL OFF TO RESET PUMP OR UNPLUG PUMP AND PRESS OFF TO POWER OFF CODE NUMBER: XXX"</p> </div> | A software-detected malfunction has occurred. Depending on the type of malfunction, infusion stops on the affected channel or both channels. | Connect AC power cord to power source. Press channel OFF control to turn off the affected channel(s). Press POWER ON, press CHANNEL SELECT, reenter rate and VTBI, and press START to resume the infusion(s). |
| CHANNEL MALFUNCTION Audio: malfunction Visual: Channel Display: <ul style="list-style-type: none"> Rate displays flash "- - - -" ALARM and STANDBY indicators flash Central Display: <div> <p>CHANNEL MALFUNCTION REMOVE IV SET IMMEDIATELY. A MALFUNCTION HAS BEEN DETECTED ON THIS CHANNEL. THIS INFUSION HAS BEEN STOPPED.</p> </div> | A software-detected malfunction has occurred on the indicated channel. Infusion on affected channel stops. | Immediately, remove IV set(s) and press CHANNEL OFF to silence alarm. Infusion(s) on non-affected channels may be continued pending availability of a fully operational pump. Central Display: <ul style="list-style-type: none"> "ERROR XXX" displays for appropriate channel. |

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| Malfunction | Meaning | Response |
|--|---|---|
| RATE DISPLAY FAILURE Audio: malfunction Visual: Channel Display: <ul style="list-style-type: none"> • Rate(s) flash • "Rate Display Error - Rate = xxx" scrolls Central Display: <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> A Rate Display failure has been detected. Infusion(s) will continue as programmed. Service pump as soon as possible. (Press ENTER to continue) </div> | Software has detected a malfunction in one or more of the rate displays. Infusions on both currently operating channels continue. | Replace with operable unit as soon as possible. Press OFF to power down the PC-2TX. |
| AUDIO FAILURE Audio: malfunction Visual: Channel Display: <ul style="list-style-type: none"> • Audio Failure Central Display: <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> AUDIO FAILURE A PROBLEM HAS BEEN DETECTED WITH THE PUMP'S AUDIO. TAKE PUMP OUT OF SERVICE (Press ENTER to continue) </div> | Software has detected a malfunction of the audio system. Infusions on both currently operating channels continue. | Replace with operable unit as soon as possible. Press OFF to power down the PC-2TX. |
| (HARDWARE-DETECTED MALFUNCTION) Audio: malfunction Visual: none | A hardware-detected malfunction has occurred. Infusion on both channels stop. | Ensure that the AC power cord is connected to an external power source. Press POWER ON or OFF control to reset the audio and turn off electrical power to the PC-2TX. (If audio persists, press POWER ON, then SILENCE. Perform normal power off procedures and replace PC-2TX with operable unit.) |

3.5 AUDIO ALERT SYSTEM

The PC-2TX is programmed to produce eight distinct audio alerts.

The characteristics of the accompanying audio sounds are as follows:

| Type | Sound | Notes |
|------------------------------------|---|--|
| switchover | six short beeps | variable volume; can be silenced and disabled in the SYSTEM CONFIGURATION |
| prompt | one short beep every two seconds | variable volume; can be silenced |
| key click | one short beep | fixed minimum volume; cannot be silenced; can be disabled via the SYSTEM CONFIGURATION |
| illegal keypress | two short beeps | variable volume; cannot be silenced, can be disabled via SYSTEM CONFIGURATION |
| advisory | one short beep every fifteen seconds | variable volume; can be silenced |
| alarm | three selectable profiles (selectable in System Configuration) Profile 1 - 500msec ON, 1500msec OFF, 500msec ON, 1500msec OFF... Profile 2 - 50msec ON, 50msec OFF, 400msec ON, 1sec OFF... Profile 3 - 400msec ON, 500msec OFF, 400msec ON, 500msec OFF... | variable volume; can be silenced |
| malfunction (software detected) | pairs of long beeps | fixed 75 decibel volume; cannot be silenced |
| malfunction (hardware detected) | constant audio tone | fixed 75 decibel volume; cannot be silenced |

3.6 NURSE CALL FEATURE

The PC-2TX incorporates a Nurse Call feature that will activate an externally powered nurse call system when the instrument initiates any of the following conditions:

| | |
|---------------|---|
| Alarms: | All |
| Malfunctions: | All |
| Prompts: | PRESS START |
| Advisories: | INFUSION COMPLETE-KVO, EMPTY CONTAINER-KVO, LOW BATTERY and REPLACE BATTERY |

SECTION 4 - PRINCIPLES OF OPERATION

4.1 INTRODUCTION

This section describes the functional operation of the mechanical and electrical/electronic sub-systems of the IMED® GEMINI PC-2TX® Volumetric Infusion Pump/Controller ("PC-2TX"). The material is presented in a manner and format that is complementary to the troubleshooting routines delineated in Section 5 - Maintenance. The technical descriptions are referenced to the electrical schematics, mechanical diagrams and illustrated parts breakdowns presented in Sections 4, 5 and 6.

The functional descriptions presented in this section are divided into two subsections. The first addresses the mechanical system operation and the second describes the electrical/electronic control circuits and operational displays. The electrical theory of operation is described in relation to the Functional Block Diagram depicted in Figure 4-2, and can be best understood by following the description on the logic diagrams, display board schematic and interconnect diagram.

4.2 MECHANICAL OPERATION

The following material is presented in a manner that assumes the reader has a basic understanding of the information provided in Sections 1 through 3 of this manual and in addition, has hands-on experience in setting up and operating the PC-2TX. Direct observation of the mechanical sequence of events that take place during instrument operation is not possible with the pumping mechanism and strain beam installed in the PC-2TX. However, by reading the following text while referring to the appropriate figures, a thorough understanding of the instrument's mechanical operation can be acquired.

4.2.1 Physical Description

4.2.1.1 Pumping Mechanism

The pumping mechanism assembly consists of three principle subassemblies: the stepper motor, the camshaft/pumping finger housing and the motion sensor (see Figure 4-1). The stepper motor drive shaft is connected to the camshaft by a flexible coupling. The encoder wheel of the motion sensing assembly is connected directly to the top of the camshaft. The camshaft is configured with 12 vertically staged cam lobes. The eccentric axis of each lobe is offset 30° counterclockwise from the lobe directly above. This positioning provides full forward travel for each pumping finger sequentially from top to bottom during each counterclockwise (when viewed from above) revolution of the camshaft. The cam lobes are evenly spaced except numbers 9 and 10 which are separated by 5/8" to accommodate a strain beam type pressure sensor.

4.2.1.2 Strain Beam (Pressure Transducer)

The strain beam assembly consists of the housing assembly, a strain beam and sensing finger (see Figure 4-3). The housing assembly is mounted on the front case assembly behind the urethane pump seal and is positioned between fingers 9 and 10 of the pumping mechanism. Four strain sensitive resistors are deposited on the strain beam, two on the tension section and two on the compression section.

4.2.2 Functional Operation

4.2.2.1 Pumping Mechanism

In the Normal operating mode, the PC-2TX is initialized when the POWER ON control is actuated. The selected channel's pumping mechanism begins operating when an administration set is installed, 'legal' infusion parameters are programmed and the

PC-2TX

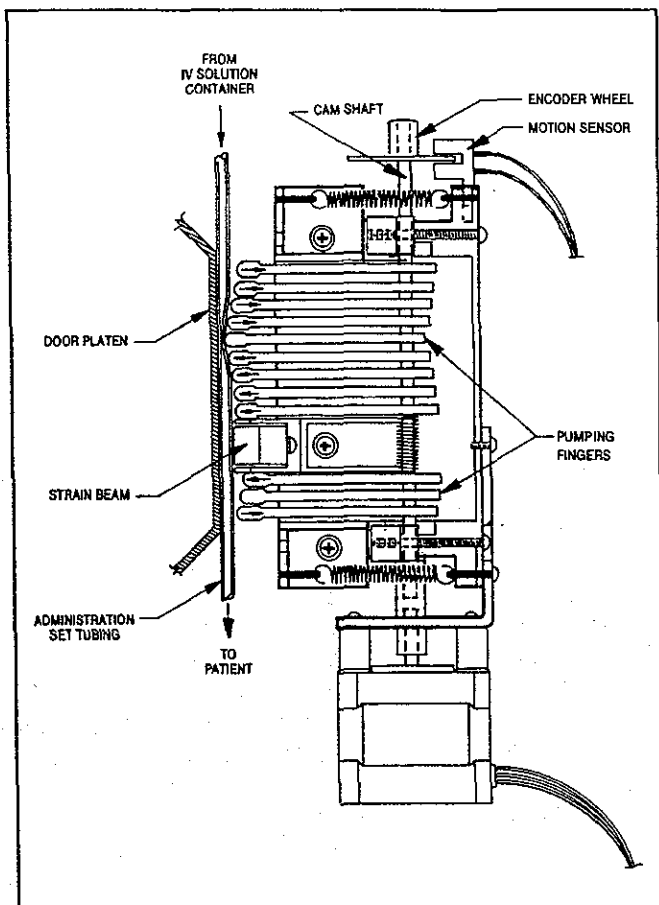


Figure 4-1. PC-2TX Pumping Mechanism

START control is actuated. The camshaft is coupled directly to the stepper motor. Stepper motor speed is variable and is proportional to the infusion rate programmed for the selected channel. Volume to be infused (VTBI) is a function of the total number of steps issued to the motor for a programmed infusion rate. The encoder wheel and motion sensor located on top of the pumping mechanism's top plate assembly provides the electronic control system with camshaft position and direction.

When an administration set is installed in the pumping chamber and the access door is closed and latched, the set's Flo-Stop is opened and the pumping segment tubing is compressed between the fully extended pumping finger and the door platen, thus preventing free flow. The pumping mechanism is activated following actuation of the START control in conjunction with normal instrument operating procedures. The stepper motor rotates the camshaft at a cyclical rate proportional to the programmed infusion rate. Each

pumping cycle consists of 200 motor steps of 1.8° each. Inter-step timing of the motor is varied as necessary to dampen the inherent non-linearity of peristaltic pumping mechanisms and produce a uniform rate of fluid flow across each pumping cycle. The sequential extension and retraction of the pumping fingers from top to bottom results in a downward moving compression zone within the administration set's pumping segment (see Figure 4-1) which creates positive pressure on the outlet side (distal end) of the tubing set. The elastomeric resilience of the pumping segment tubing causes it to return to its cylindrical shape as each of the pumping fingers recede from the extended position. This reshaping creates a vacuum in the inlet (proximal end) of the tubing and causes fluid from the IV solution container to refill the tubing. This peristaltic like action results in a constant, controlled flow of IV solution from the fluid container to the patient. During the pumping cycle, between motor steps 62 through 77, the strain beam senses the hydrostatic pressure in the column of fluid above the strain beam. In the event there is restricted flow in the tubing set between the fluid container and the pump and the tubing can not refill completely, the strain beam will sense a lower than normal pressure and cause the pump/controller to enter either a LOW FLOW condition when operating in the Controller mode or either a PARTIAL OCCLUSION-FLUID SIDE or OCCLUSION-FLUID SIDE condition when in the Pump mode.

In the Controller mode, if the pressure differential between patient and fluid container drops to less than 6 inches of water pressure (0.25 psi), the pumping mechanism will stop. The microprocessor monitors the duration of a 'low flow' condition, automatically increases the programmed delivery rate by ten percent and resumes pumping once the fluid container to patient pressure differential exceeds 12 inches of water pressure (0.5 psi). The increased flow rate allows the instrument to compensate for the period of 'low flow' and bring the actual volume infused in line with the programmed infusion parameters. Once the pump has completed this catch-up cycle, the delivery rate reverts to the programmed rate. Should the 'low flow' condition persist for more than 1 minute or the calculated time necessary to compensate for the under-infusion condition exceeds 30 minutes, the instrument will enter an Occlusion alarm condition.

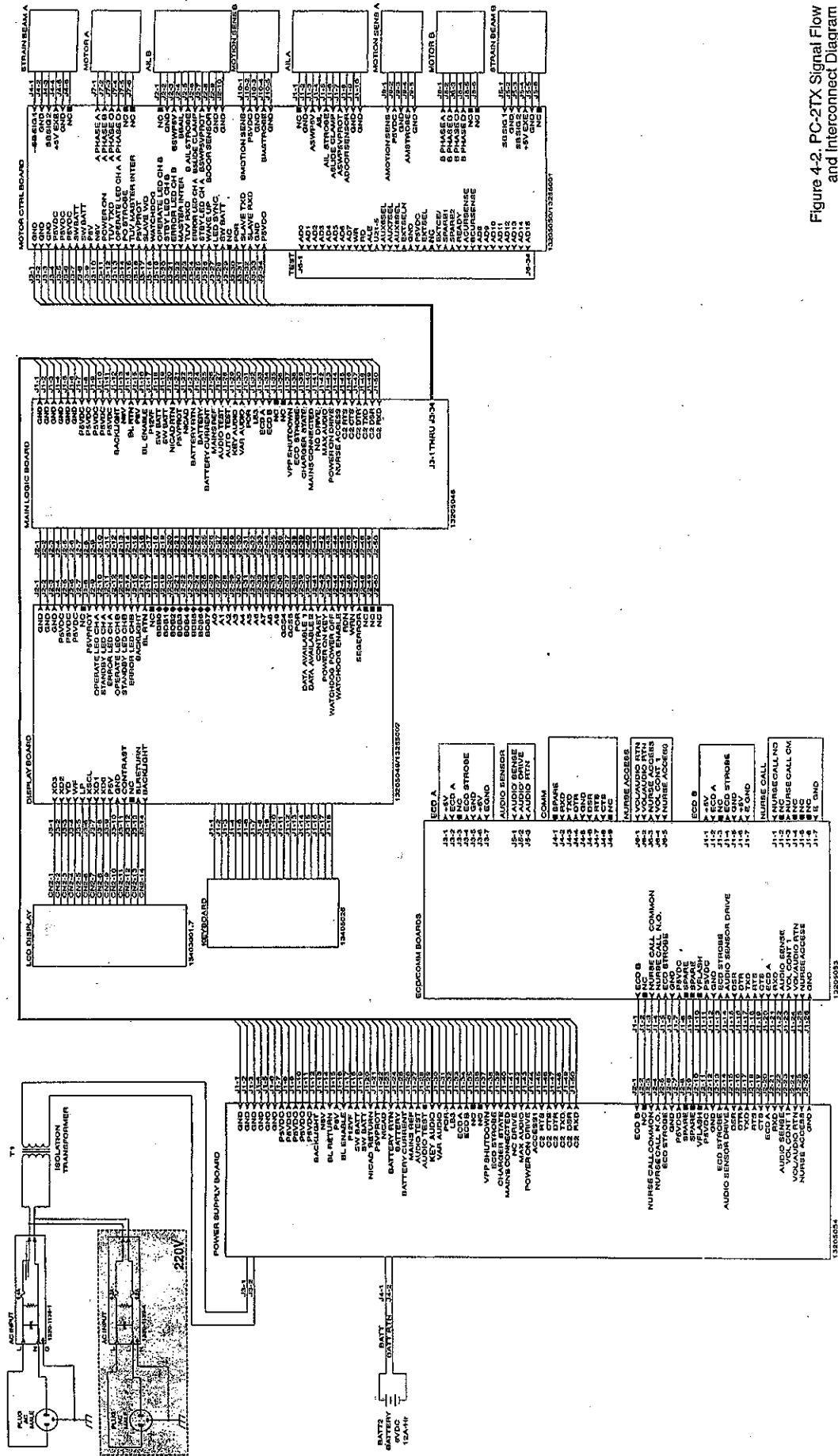


Figure 4-2. PC-2TX Signal Flow and Interconnect Diagram

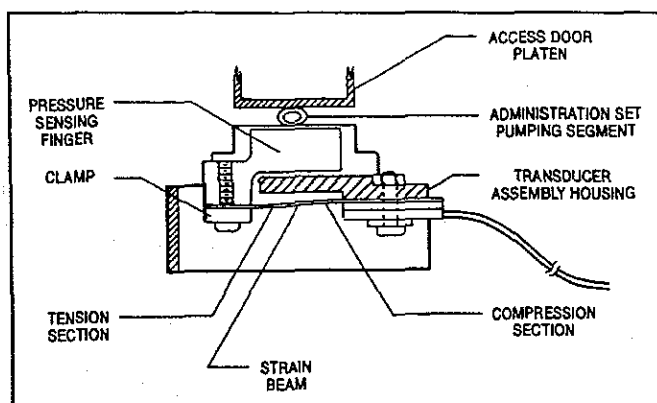


Figure 4-3. Cross Section of Strain Beam Assembly

During a pumping cycle, between motor steps 0 through 20 and 120 through 199, the strain beam measures the pressure in the distal end of the tubing. Any restriction to flow in the distal tubing will cause the pressure to increase and the tubing to expand. The strain beam will sense this increasing pressure and when it exceeds a predetermined value will cause the pump/controller to invoke either an OCCLUSION (Controller mode) or an OCCLUSION-PATIENT SIDE (Pump mode) alarm condition. During any alarm condition, the pumping mechanism stops and appropriate audio and visual alerts are issued. (Between motor steps 21-62 and 77-119 the pressure sensor can not read distal or proximal pressure).

4.2.2.2 Strain Beam (Pressure Transducer)

When the pumping segment of a primed administration set is installed in a PC-2TX pumping chamber and the access door is closed, the strain beam will sense the pressure in the tubing. Actual pressure values are determined by pumping finger position within a pumping cycle and the hydrostatic pressure in the tubing at the time of measurement. A typical amplified strain beam voltage would be in the range of 1 to 2 volts if the strain beam was looking at the patient. During pump operation, a positive pressure decrease in the fluid column above or an increase in the fluid column below the pump will cause the tubing to contract/expand respectively resulting in deflection of the strain beam. This deflection will result in a change in the potential measured across the bridge. A decrease in pressure within the tubing set's fluid column will result in a reduction in the potential measured across the bridge circuit. An increase in pressure within the tubing set's fluid column will result in an increase in the potential measured across the bridge circuit.

4.3 ELECTRICAL/ELECTRONIC OPERATION

An understanding of the electrical/electronic theory of operation can be acquired by reading the ensuing subsystem descriptions while following the functional schematic for the respective subsystem.

The PC-2TX has a distributed processor type architecture with a 80C188EB serving as the main processor and one 80C198 serving as slave controller. The main processor controls all interface and organizational functions while the slave controller controls the pumping mechanism and access door, air-in-line and slide clamp sensor data. The slave communicates with the main processor via a serial port. The main processor processes data from the keypad, slave controller, RS-232-C and auxiliary (optional) serial ports and the empty container detectors. This data is then used to determine the state of the pump.

4.3.1 Functional Description

4.3.1.1 Main Logic Board

A 80C188EB microcontroller with its accompanying program and data memory form the core of the PC-2TX main logic board. The 80C188EB is a highly integrated processor that includes the 8088 processor core, two serial ports, timer counter, interrupt controller, chip select and ready logic. These functions are expanded externally to include additional digital I/O and interrupt capability to form the main controller core. Additional functions added to augment the main processor core include an 8 channel analog to digital converter, a single channel digital to analog converter, real time clock, watchdog timer and power on logic. U9 (Figure 4-7/S2) buffers the processor bus for off board peripherals.

The 80C188EB U1, (Figure 4-7/S1) is supported by up to 512K bytes of program memory, U31, U30, U14, U7 (Figure 4-7/S1) and up to 256K bytes of data memory. The entire data memory block has battery backup to prevent data loss when power is removed. U27 (Figure 4-7/S2) expands the 80C188EB's interrupts via INT0 and INT2 of U1 (Figure 4-7/S1). These expanded interrupts include the keyboard input, real time clock, optional safety processor, A-D converter and the slave controller. U29 (Figure 4-7/S2) supports the real time clock functions and is battery backed to maintain time when the pump is off. The digital to analog converter, U26 (Figure 4-7/S2) is used to control

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the contrast on the LCD main display. The output is translated to the correct voltages required by the LCD by U24 and U4 (Figure 4-7/S2). U32 (Figure 4-7/S2) implements the analog to digital I/O functions. Channel 0 senses the contrast level, channel 1 the programming flash voltage, channel 2 the main power reference voltage, channel 3 the audio test signal, channel 4 the NiCad battery voltage, channel 5 the main battery voltage, channel 6 the main battery current and channel 7 is a 2.5 volt reference supplied by U34 (Figure 4-7/S2), used to validate A-D inputs. U20 with Y3 and associated components on Figure 4-7/S2 generate the clock required by the analog to digital converter (U32, Figure 4-7/S2).

Q6 and R43 (Figure 4-7/S2) form the NiCad test circuit which are used to determine the state of the NiCad battery.

U13, U15 and U16 (Figure 4-7/S3) form the digital I/O expansion with U13 and U16 serving as output ports and U15 as an input port.

The watchdog timer function is implemented by U5, R22, R17 and C25 (Figure 4-7/S3). The main processor reset pulse is coupled via C23 and OR'ed with the power on reset in U11 (Figure 4-7/S3). Q2 serves as the slave controller's reset disable. The output of the watchdog timer is latched in the EPLD, U25. The watchdog signal is then gated with the main processor I/O in U11 (Figure 4-7/S3). The output of this gate is distributed to the slave controller where it is used to disable the motor drive circuitry. The latched watchdog output is inverted by U12 (Figure 4-7/S2) and labeled "watchdog enable". It is used by the keyboard to enable the "Power On" key to power the pump off in case of a watchdog condition. Inverters U18 and U12 (Figure 4-7/S3) form the logic to select serial communication between the slave processor or the optional safety processor.

4.3.2 Functional Operation

4.3.2.1 Power On/Power Off Subsystem (Logic Board)

The power on/off control signal is generated by U25 (Figure 4-7/S3). Power On can result from one of three sources, the power on key, auto power on or main power connected.

Two power off states can exist: sleep mode or

power off mode. The instrument is in the sleep mode any time it is plugged in and not being used; outward appearance is off, but the main processor is powered on and is monitoring system functions. The auto power on feature activates the instrument whenever a disposable is installed with the Flo-Stop and door open. The auto power on signal is generated by the slave controller. The sensor strobe clock is generated by U21 (Figure 4-7/S3) and distributed to the slave controller where it is used to sample the appropriate sensors. In the sleep mode, the power on signal to the power supply from U25 (Figure 4-7/S3) is always active. The instrument is awakened by pressing the power on key and sensed by the main processor or communications from the slave processor.

In the true power off state, signals issued by the slave controller (auto power on), power on key actuation or AC power connected causes U25 (Figure 4-7/S3) to issue the power on signal to the power supply board.

4.3.2.2 5 Volt Regulator Subsystem

The 5V power supply is formed by operational amplifier U12 (Figure 4-9/S2), transistor Q14, and voltage reference U2. U2 provides 2.5 volts to the reference input of amplifier U12. Amplifier U12's output operates pass transistor Q14 in the linear region. Resistors R58 and R73 form a divider circuit that is fed back to the sense input of U12 (Figure 4-9/S2). The amplifier will drive Q14 to ensure the sense and reference inputs are equal. As the resistor divider ratio is 2:1, the output of Q14 will be at 5 volts.

5 volt current is monitored via R29. When the 5 volt current exceeds about 2 Amps, amplifier U12 turns on driving the sense input of the regulator high turning off Q14.

A crowbar circuit is employed for overvoltage protection. When the 5 volt output exceeds approximately 5.6 VDC, transistor Q6 is turned on via Q13 and U10 (Figure 4-9/S2). This has the effect of shorting out the battery voltage, thus drawing high current and blowing fuse F1.

4.3.2.3 ± 8.5 Volt DC Power Supply Subsystem

The ± 8.5 volt power supply circuit resides on the power supply board (Figure 4-11 Series, Sheet 2) and is implemented with a LM3578 (U4) switching

regulator. Battery is supplied to transformer (T1) at pin #2. Pin #5 of the transformer primary winding is routed to regulator (U4-6, Figure 4-9/S2) the collector of the internal pass element. When the transistor is turned on, energy is stored in the primary of T1 until U4 (Figure 4-9/S2) turns off the transistor. The voltage induced in the transformer's secondary is blocked by diodes D9 and D10. When the transistor is turned off, the current in the transformer primary is maintained by the collapsing magnetic field inducing current in the transformer secondary which forward biases diodes D9 and D10 charging capacitors C13 and C15. The charged capacitors provide approximately +8.5 and -8.5 volt outputs. These outputs are monitored by R38 and R39 respectively and are fed back into the chip-resident comparator which adjusts the duty cycle of the transistor to maintain a 17 volt differential across the transformer output terminals.

4.3.2.4 5 Volt Protected Subsystem

The 5 volt protected voltage is required to provide power to the non-volatile ram located on the main logic board when system power is turned off. It is also used by the circuits in the backup audio and power on control (including auto power on).

Under normal operation, the 5 volt protected voltage is generated from the main system battery via a step down linear regulator (U6 and associated components.) The system battery or the bridge raw DC voltage provides charging current to the backup NiCad battery B1 via D11 and R33 or R67 and D17 respectively. Should the main battery be removed or fail, the NiCad battery supplies the source to the 5 volt protected regulator via D15.

4.3.2.5 Battery Charger Subsystem

The battery charger consists of components mounted on the power supply board. The circuit utilizes a switching regulator concept based on the UC2524A (U13, Figure 4-9/S1) regulator chip. Unregulated AC voltage is rectified through the diode bridge (D1,D3,D5,D7). The unregulated DC output from the rectifier bridge charges capacitor C11. C11 provides filtered DC voltage to the regulator chip and the switching circuit consisting of Q10, Q18, Q21 and Q7.

Battery charger output is reduced by the resistor divider consisting of R74, R20 and R18 and then applied to U13-1. U13 compares this voltage

against a 5 volt reference voltage at U13-2 and adjusts the duty cycle of U13-12 and U13-13, when these two voltages are unequal. This variable duty cycle is level shifted through Q7, Q18, and Q21 and applied to the gate of FET Q10. This results in Q10 having a duty cycle equal to that on U13-12/13. The voltage input to L1 is approximately a 40 volts p-p square wave at a switching frequency of ≈ 25 KHz. The AC component is filtered out by the L1/C14 low pass filter and is applied to the battery.

Charger output is monitored by a circuit consisting of U9, Q9, R3 and R4 (Figure 4-9/S1). When the battery voltage exceeds ≈ 7.9 volts, the voltage at the divider consisting of R3 and R4 exceeds the reference voltage of U9 (2.5 VDC). When this occurs, the output of U9 begins to draw current thus turning on FET Q9. Turning on Q9 turns on the gate of Q15 via R7 and R10. This has the effect of shorting out the rectified voltage supply. While the short is applied, large currents are drawn from the transformer thus blowing the primary fuse and disabling the charger completely.

Battery current is monitored by U1 (Figure 4-9/S1) and limited to ≈ 2.6 amps by adjusting the duty cycle of FET Q10 as discussed above. Battery current is sensed by R11 and applied differentially to U13-5 and U13-4. When this voltage exceeds 0.2 VDC, U1 reduces the duty cycle to yield a current limit of ≈ 2.6 amps.

Battery voltage is adjusted by R74 to produce an output voltage of 6.9 VDC when the battery current is below ≈ 300 ma. Battery current is monitored by the main processor from the drop across R13. When the battery current exceeds ≈ 350 ma, the main processor applies 5V to Q16 gate thus connecting R21 in parallel with R18. This has the effect of increasing the charger output voltage to 7.4 VDC. Power is always applied to the system when plugged in so that the main processor can monitor battery charging.

4.3.2.6 System Reset Circuit

A system reset output is provided at U11-7 (Figure 4-9/S2). When 5 volt power comes on, comparator U11-7 switches low until capacitor C30 charges to 2.5 volts via R64, R66, (≈ 300 ms).

4.3.2.7 Battery Depleted Circuit

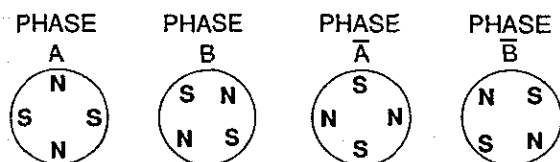
A low battery detection circuit is provided which

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when active, forces a system shut-down with a continuous audio alarm. The low battery detector consists of comparator U11 (Figure 4-9/S2) and associated components. When the battery voltage becomes less than ≈ 4.8 volts, the output becomes high. Hysteresis is provided so that the output will not return low until the battery has been charged above the low battery threshold and the system may be turned back on.

4.3.2.8 Pumping Mechanism

The pumping mechanism employs a hybrid stepper motor to provide the torque to turn the camshaft and operate the pumping fingers. The hybrid motor employs a multi-toothed rotor and stator with an axially magnetized concentric magnet mounted on the rotor shaft. The teeth on the iron cups attached to the opposite ends of the concentric, permanent magnet are offset from each other one half tooth pitch. The rotor to stator tooth ratio is 50:48. This provides 7.5° stator and 7.2° rotor inter-tooth spacing. The 0.3° differential across a six stator tooth span (45° of arc) provides a 1.8° rotor to stator offset. The stator is wound in a four-pole four-phase configuration. Stator polarity changes 45° as each of the four phases is sequentially energized (see following diagram).



The positional relationship between the central tooth on a stator pole and the rotor is shown with the A phase energized in Figure 4-11. When the B phase is energized and the stator polarity changes 45° , the rotor turns to align teeth 7/7' and 32/31, a 1.8° rotation. Rotational realignment occurs as each motor winding phase is sequentially energized and the stator polarity changes 45° clockwise. This stepper motor configuration provides 200 incremental motor steps per revolution.

The PC2-TX contains one dual motor control board, containing the circuits necessary to control each of the two pumping channels.

The controller utilizes its own 80C198 16 bit microcontroller with an integral A/D converter. The logic subsystem includes a programmed memory containing the operating code; and an 8K x 8 RAM.

A decoder is provided to provide chip selects to define ROM, RAM, and I/O memory space. The microcontroller operates at a frequency of 10 MHz.

The sensor and motor drive circuits are duplicated for each of the two channels of the controller. When reference designators are mentioned they refer to the channel 'A' circuits.

MOTOR DRIVE CONTROL

The stepper motor is bipolar driven with the microcontroller controlling the motor phase sequence. Each of the windings are driven via an 'H' bridge utilizing FETs as the switching elements. A current source controls the current as sensed across a .25 ohm resistor R39. Each time the motor is stepped, a higher 'step' current (approximately 300 ma.) is applied for 14 ms. The motor current then reverts to a 'holding' current of 145 ma. The current is produced by an efficient step down switching regulator U4, (Figure 4-10/S2) and associated components).

NOTE

The -2 version of the Motor Controller board (Figure 4-10) utilizes discrete components (VN2206) for U30-U33 in place of the integrated circuits (VN3206N6) used on the -1 version.

4.3.2.9 Strain Beam

The PC-2TX employs a strain gauge subsystem to input administration set pressures to the micro-processor through its integral Analog to Digital converter. The subsystem incorporates a matched resistor bridge on the pressure sensing beam and a signal conditioning circuit. Each leg of the resistor bridge is nominally 1200 Ω . The Zero Balance Specification is 0.3 mV/V_{EX}. With no load applied to the beam and 5 volts excitation, the Zero offset output will be ≤ 1.5 mV. Application of a positive force, up to the 1 pound maximum load capacity of the strain beam, will lower the resistivity of the resistors in compression and increase the resistivity of the resistors in tension. At full force applied the bridge will produce a 5 to 10 mV change in output voltage. The signal conditioning circuit provides amplification and offset compensation to the low level signal output by the bridge circuit.

The conditioning circuit's primary amplifier is a balanced differential to single ended instrumentation type with a gain of 511. An offset adjust is provided.

The output is further amplified through a subsequent stage with a gain variable between 1 and 6. This stage incorporates a diode (D12, Figure 4-10/S2) between the output and the feedback divider which prevents the output from going negative. A post amplification filter consisting of R26 and C32 rolls off the gain at about 40Hz. The diode (D9, Figure 4-10/S1) clamps the output voltage at V_{CC} . This signal is then supplied to the Analog input on the microprocessor for digital conversion.

The microprocessor's internal A/D converter has 10 bit resolution capability; however, in this application the least significant bit is discarded leaving 9 bits usable which yields a per bit resolution ratio of 1:512. Using a reference voltage set at 5V, each bit is equal to $\frac{5}{512}$ or ≈ 9.76 mV. The strain beam calibration process involves applying known pressures and then adjusting the gain and offset (SPAN and ZERO) balance of the signal conditioner to yield set voltages. Since the converter is unipolar and will only process signals in the range of 0 to V_{REF} , the calibration points are established at 0 and 10 psi (69 kPa) which correspond to nominal values of 1.5 and 4.0 volts respectively. The 10 psi (69 kPa) differential between calibration limits equates to 2.5 volts. On a 5 volt scale this equates to using $\frac{3}{5}$ of the available scale, i.e. $\frac{1}{2}$ of the 512 bits or 256 bits. Converting psi to inches of water pressure, the 10 psi (69 kPa) differential equals 332 inches (843 cm) of water pressure. This establishes the resolution of the converter at 1.30 inches (3.29 cm) per bit. Setting the 0 psi value equal to 1.5 volts allows the system to recognize and measure pressures less than atmospheric which can occur during an upstream occlusion. In addition, the strain beam will also detect the presence of an administration set in the pumping chamber.

4.3.2.10 Air-In-Line Detector

The active elements of the PC-2TX's air-in-line detection system include two piezo-electric (PE) crystals and a signal processing circuit. The PE crystals and acoustic lenses are bonded into recesses in the AIL/SCD housing (see Figure 4-4). The signal processing circuit is part of the AIL/SCD printed circuit board. Ultrasonic sensing is used for air-in-line detection since ultrasonic wave transmission is independent of fluid opacity.

Ultrasonic signal transmission (acoustic impedance) through all IV compatible solutions falls within a very discrete range which is easily discernable from passage through air.

The air-in-line detector is located below the pumping mechanism and checks the integrity of the fluid column entering the patient side (distal portion) of the tubing set. The acoustic lenses and installed tubing set provide a coupling path for the continuous wave ultrasonic transmission to travel from the transmitting to the receiving crystal. When the tubing contains an IV solution, the acoustic impedance is low and maximum energy is coupled to the receiving element which generates a voltage signal that is proportional in amplitude and frequency to the coupled energy. If an air bolus is interposed between the lenses, the acoustic impedance is significantly increased as the acoustic wave is reflected by the liquid-air interface. The energy received is reduced and the voltage output is commensurately reduced. This signal differentiation combined with the instrument's programmed delivery rate is used to measure the volume of the air bolus.

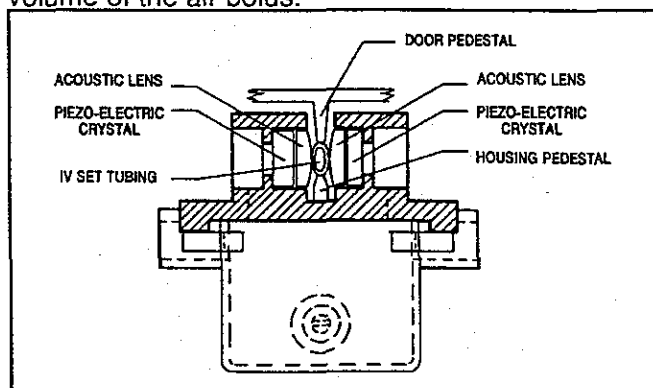


Figure 4-4. AIL Detector Cross Section

The AIL detector's signal processing circuit drives the transmitter and amplifies, detects and performs a threshold comparison on the received signal. The system is strobed by a software generated signal to validate system operation.

The output of the AIL circuit is sampled just prior to the strobe changing state which yields the following truth table:

| | | AIL HI | AIL LO |
|------------|---|--------|-----------|
| TRANSITION | A | AIR | LIQUID |
| TRANSITION | C | CKT OK | CKT FAULT |

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The calculation of air bolus size is based on the assumption that at a given delivery rate air and fluid will pass through the sensor at a uniform rate. The length of time required for an air bolus to pass through the detector is measured by counting the number of motor pulses when the sensor is "seeing" air. Time is therefore measured in number of interrupts per bolus. When the resultant time exceeds the time required for 38 motor steps, the instrument enters an "AIR-IN-LINE" alarm condition.

4.3.2.11 Slide Clamp Detector

The slide clamp detection subsystem consists of a photo diode and transistor plus a signal control and comparator circuit. The photo diode and transistor are mounted diametrically on the sides of the slide clamp recess on the AIL/SCD housing (see Figure 4-5). The signal processing circuitry for the slide clamp is incorporated into the AIL/SCD printed circuit board. When the slide clamp circuit is energized, a beam of light is projected across the slide clamp recess. The beam is positioned at a point where movement of the slide clamp towards "open" will interrupt the light beam just before free flow occurs in the tubing. If the light path is interrupted with the pumping chamber access door open, the instrument will enter a "FLO-STOP OPEN / CLOSE DOOR" alarm condition.

The photo diode is driven by the same micro-processor strobe used by the AIL detector. When the strobe is low and the optical path is not obstructed (Flo-Stop closed or set not installed), current is induced in the photo-transistor which produces a high-stop logic level signal to the microprocessor. When the optical path is obstructed (set installed and Flo-Stop open), the output of the photo-transistor provides a low logic level signal to the microprocessor. Comparing the slide clamp detector circuit output resulting from a high strobe condition against the output from a low strobe, enables the system to verify proper operation of the SCD detector.

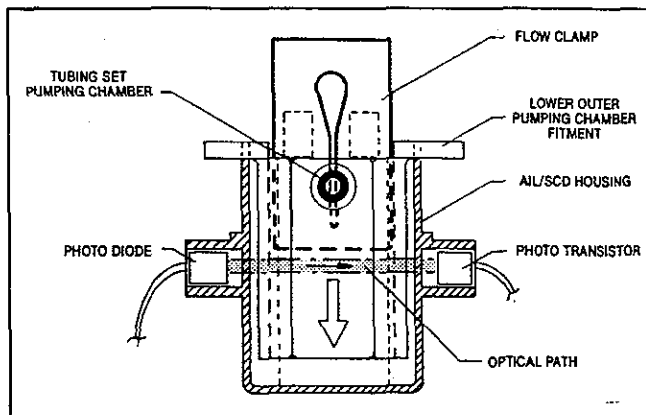


Figure 4-5. Slide Clamp Detector Cross Section

4.3.2.12 Door Sensor

The door sensor subsystem consists of a Hall Effect sensor and the logic circuitry necessary to query the sensor and to determine Open or Closed status and report the existing condition to the processor. The Hall Effect sensors are located on the rear of the front case insert assembly 2.4 inches directly below each anchor bracket assembly. The magnet is attached to a pedestal on the backside of the door latch handle. The components of the door sensor logic circuit are incorporated on the Motor Controller PC board. The door sensor is enabled by a strobe from the controller micro processor during normal operation. When in sleep mode, the main logic board provides the strobe.

4.3.2.13 Audio Subsystem

The audio subsystem consisting of an audio oscillator, audio system control circuitry, volume control and silence switch. The audio oscillator is mounted on the rear case over the audio alert aperture. The system circuitry and oscillator are incorporated on the power supply board. The audio volume control is mounted on the rear panel and the silencing feature is a function of the keypad SILENCE control. During normal instrument operation, all audio signals are initiated by the EPLD. An audio pulse is sent from the EPLD (U25, Figure 4-7/S3) to the base of transistor Q2, Q3 or Q4 (Figure 4-9/S3) to produce an audio signal of the required period and intensity. Audio signals that permit volume adjustment and silencing are routed through Q2. Keypress signals are routed through Q4 and are limited in volume intensity by RA2-7,8. Malfunction audio which is projected at maximum, volume is routed through Q3.

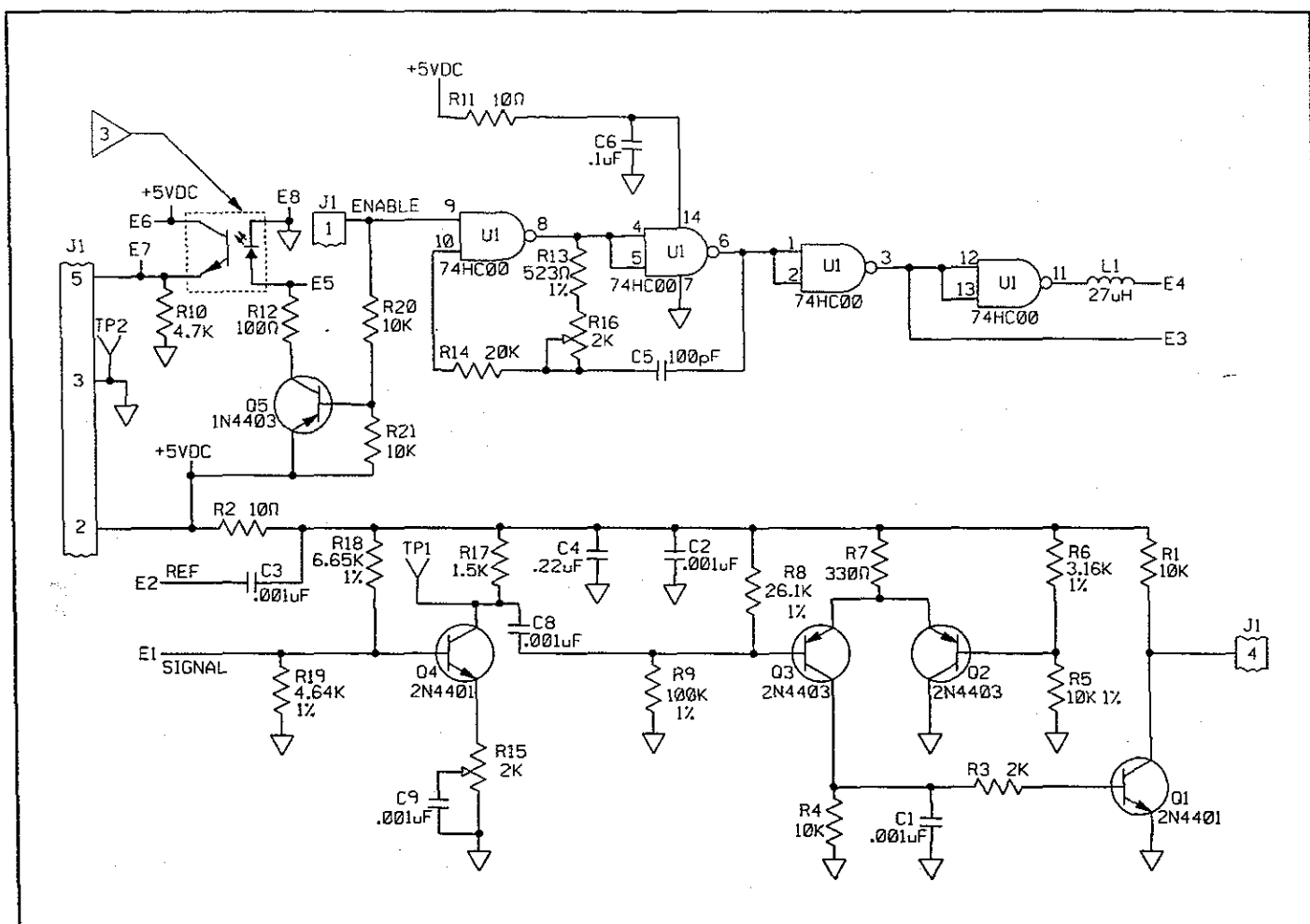


Figure 4-6. AIL/SCD Board Schematic (P/N 1340-5012)

4.3.2.14 Display Subsystem

The display subsystem consists of two rate and message displays, one for each channel, four LED indicators per channel and a LCD central message display.

The channel A rate display consists of the four 7-segment displays, DS1 to DS4, RA2 and U5 (Figure 4-8/S1). U5 interfaces to the main processor via the lower four bits of the data bus, BDB0 to BDB3 and the data bus line BDB7. The driver IC controls all drive and multiplexing functions for the rate displays.

The message display consists of IC U6 (Figure 4-8/S1), an eight digit dot matrix display. All character control, drive and multiplexing functions are implemented within U6. U6 interfaces to the main processor via the data bus and six address lines.

Both channel's rate and message displays work the same. Channel B also has its own driver circuitry.

The channel select LEDs and the four LED indicators for battery operation, AC power operation, communications enabled and communications traffic are driven by the unused decimal point locations of channel A and B's driver ICs.

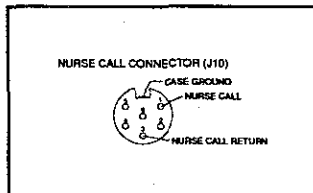
The segment error circuitry located on the display board consists of Q1 and associated diodes and resistors. The error circuit only detects open segments.

The LCD display is a module that interfaces to the main processor via the data bus. The module looks like RAM to the main processor. Its interface is via LCD driver U4 (Figure 4-8/S3) and associated circuitry. The backlight control circuit resides on the power supply board. Q11 and inverter U3 (Figure 4-8/S3) control the backlight. The contrast control logic resides on the main logic board (Figure 4-7/S3). U4, U24 and U26 (Figure 4-7/S2) control the contrast adjustment.

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4.3.2.15 Nurse Call System

During normal instrument operation (Nurse Call system - not activated) processor output to the Nurse Call circuit is high. When the processor detects a condition (malfunction, alarm or "Press Start" prompt) that dictates activation of the Nurse Call system, a high is sent through the I/O expander (U16-13, Figure 4-7/S3), to pin 10 of OR gate U37 (Figure 4-7/S3). The output of U37 at pin 8 goes high and is inverted by Q1 allowing current to flow through the K1 relay coil (Figure 4-9/S3), closing the contacts and actuating the Nurse Call system. A watchdog malfunction will input a high at U37 pin 9 causing the output of the gate to also go high, subsequently energizing the K1 relay coil and activating the Nurse Call system.



4.3.2.16 Keyboard Interface

The PC-2TX keyboard consists of a switch matrix with integrated dome switches and the control circuits mounted on the display board. The control circuitry consists of two keyboard decoders and an eight bit comparator. The decoders control all keyboard scanning functions and generates an interrupt signal, ("data available 1/2"), to the main processor when a key has been depressed. The keyboard interfaces to the main processor via the data bus and two decoded read lines. When a control is pressed, one of two data available lines will interrupt the main processor. The main processor will respond by asserting one of the encoded read lines, "readkbd1 or readkbd2", and then reading the output of the keyboard encoders on the data bus.

If a watchdog condition exists, the logic board will issue a "watchdog enabled" signal to the keyboard enabling the 8 bit comparator. The comparator compares the hardwired code for the stop key and the output of the appropriate keyboard decoder for a match. Once the stop key has been pressed, the comparator issues the "watchdog power off" signal to U25 (Figure 4-7/S3) of the logic board. U25 then removes the power on drive to the power supply turning off the instrument.

4.3.2.17 Communications Interface and Signal Definitions

To interface a host computer system with the PC-2TX, the interface cable must be configured with a 9-pin 'D' subminiature male connector with jackscrews for mechanical interconnection. Figure 4-13 Series illustrates the circuit for the RS-232-C Communications Data Port connector. Signal voltage levels are ± 8.5 VDC. Signal characteristics conform to RS-232-C Standards. Pin 5 of the Communications Data Port connector is connected to logic ground on the power supply board and is only to be used for common signal return for Tx/D, Rx/D, DTR, DSR, RTS and CTS. Pin 1 of the Data Port connector is connected. Flash EPROM programming circuitry is not to be used. The interface cable shield should only be attached to chassis ground on the host computer end of the cable. Pin 9 is also for Flash programming and should not be used. Table 4-1 defines the signals and identifies the pin numbers used to interface a host computer to the PC-2TX. The instrument utilizes ALARIS Medical C2 Communications Protocol which can be found in the C2 Communications Protocol Programmers Guide.

NOTE

Maximum leakage current to chassis ground from connected peripheral equipment must not exceed 100 μ A.

4.3.2.18 Mechanism Alarm Circuit (M.A.C.)

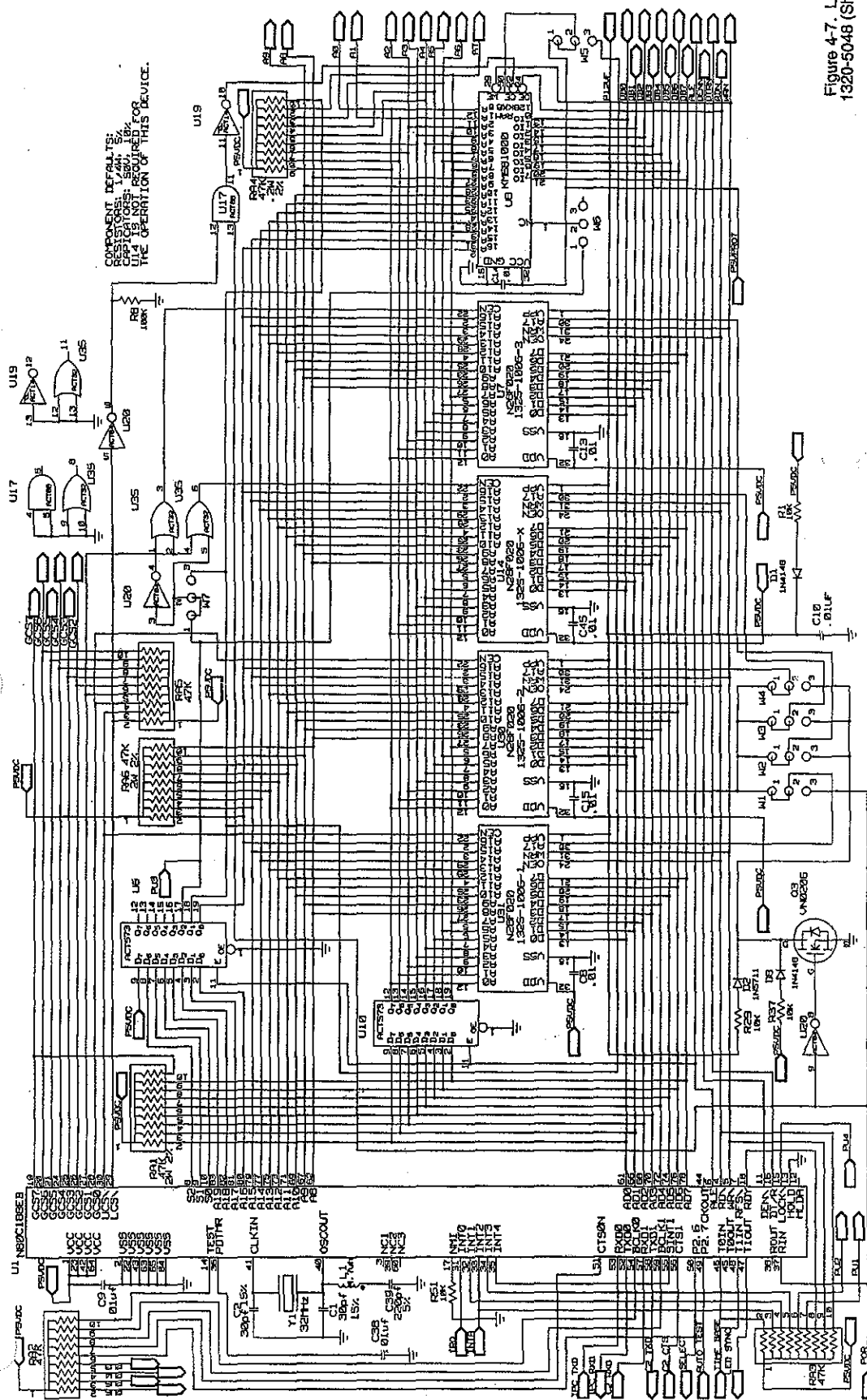
The mechanism alarm circuit is an integral feature of the PC-2TX pumping mechanism installation. The copper-bronze spring clips which are part of the upper and lower M.A.C. top plate are attached to the hinged side of the pump mechanism housing.

With the spring clips in place, the M.A.C. assembly forms an electrical circuit connecting J-1, pin 2 on the AIL board connector to J-1, pin 3 (+5 volts) on the appropriate motor control board. If the instrument is subjected to an impact load above a preset magnitude, the spring clip(s) will be dislodged; thereby, interrupting the circuit and causing a "HELP INTERNAL ERROR" message to scroll on the Channel information display for the affected channel(s) when the instrument is powered on. In addition, an error code will appear on the Central Information Display. The error code will be one of those associated with an air-in-line problem since the circuit is part of the AIL subsystem.

Anytime the "HELP INTERNAL ERROR" message is displayed, the instrument must be checked by a Biomedical technician prior to further use. M.A.C. troubleshooting procedures are described in Section 5.

Table 4-1. RS-232-C Communications Data Port Signal Definitions

| Signal Name | Number | Direction | Definition |
|---------------------------|--------|----------------|---|
| GND (Ground) | 1 | Host | Not tied to chassis ground on the PC-2TX. To be used only for protective shielding. The shield should only be connected to chassis ground on the host computer end. |
| TxD (Transmit Data) | 3 | PC-2TX to Host | Serial data transmitted to host computer from PC-2TX. |
| RxD (Receive Data) | 2 | Host to PC-2TX | Serial data transmitted to PC-2TX from host computer. |
| RTS (Request to Send) | 7 | PC-2TX to Host | When asserted, RTS indicates to the host computer that the PC-2TX has information to transmit. Can be used to tell the host computer to wait. |
| CTS (Clear to Send) | 8 | Host to PC-2TX | Asserted by the host computer to enable the PC-2TX to transmit data. |
| DSR (Data Set Ready) | 6 | Host to PC-2TX | DSR indicates to the PC-2TX that the host computer is capable of communications. (Connected and power on). |
| Signal Ground | 5 | PC-2TX to Host | Common signal return to TxD, RxD, DTR, DSR, RTS and CTS. |
| DTR (Data Terminal Ready) | 4 | PC-2TX to Host | DTR indicates to the host computer that the PC-2TX is capable of communication. (Connected and power on). |
| Not Connected | 9 | | |

Figure 4-7. Logic Board
1320-5048 (Sheet 1 of 3)

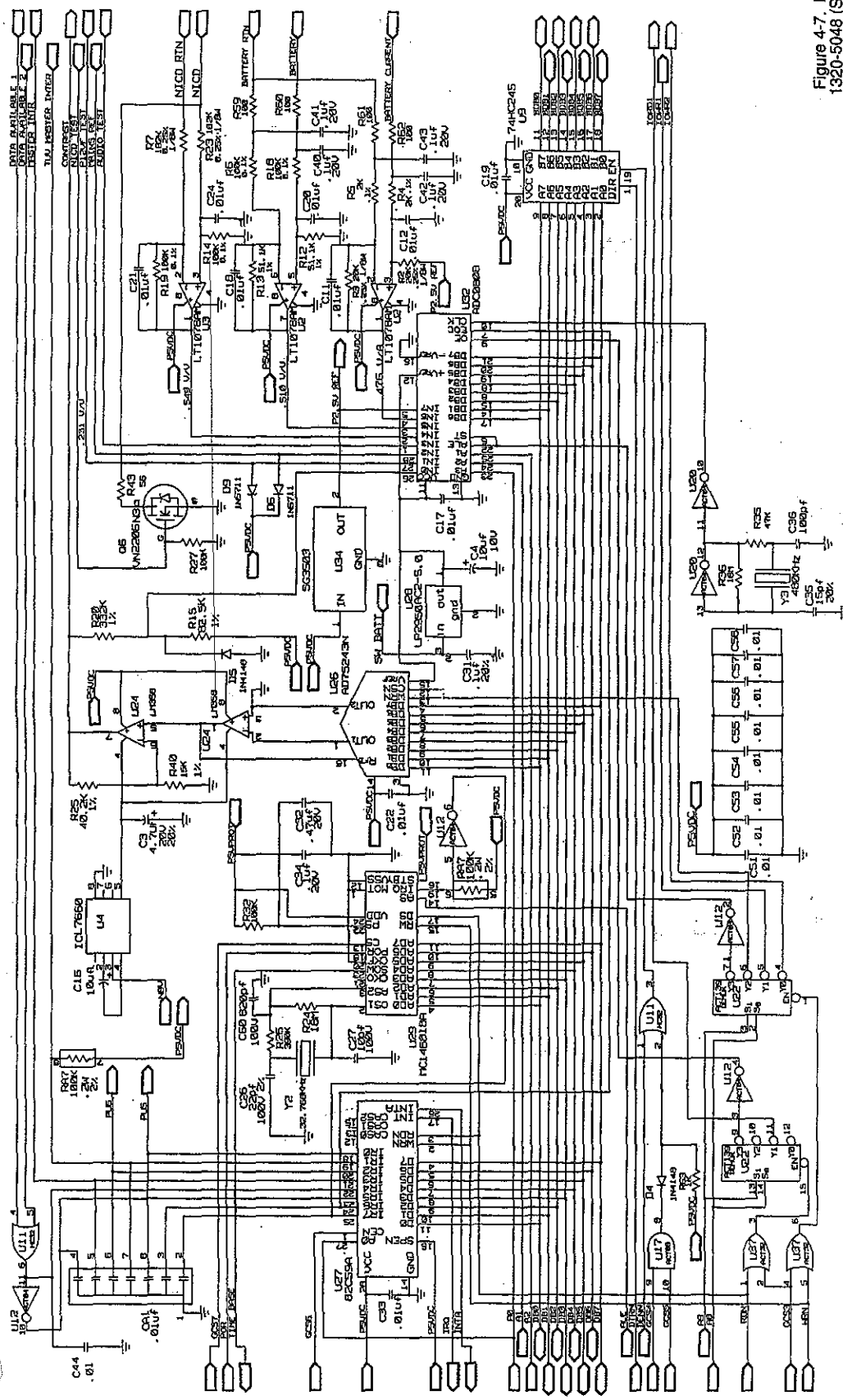


Figure 4-7. Logic Board
1320-5048 (Sheet 2 of 3)

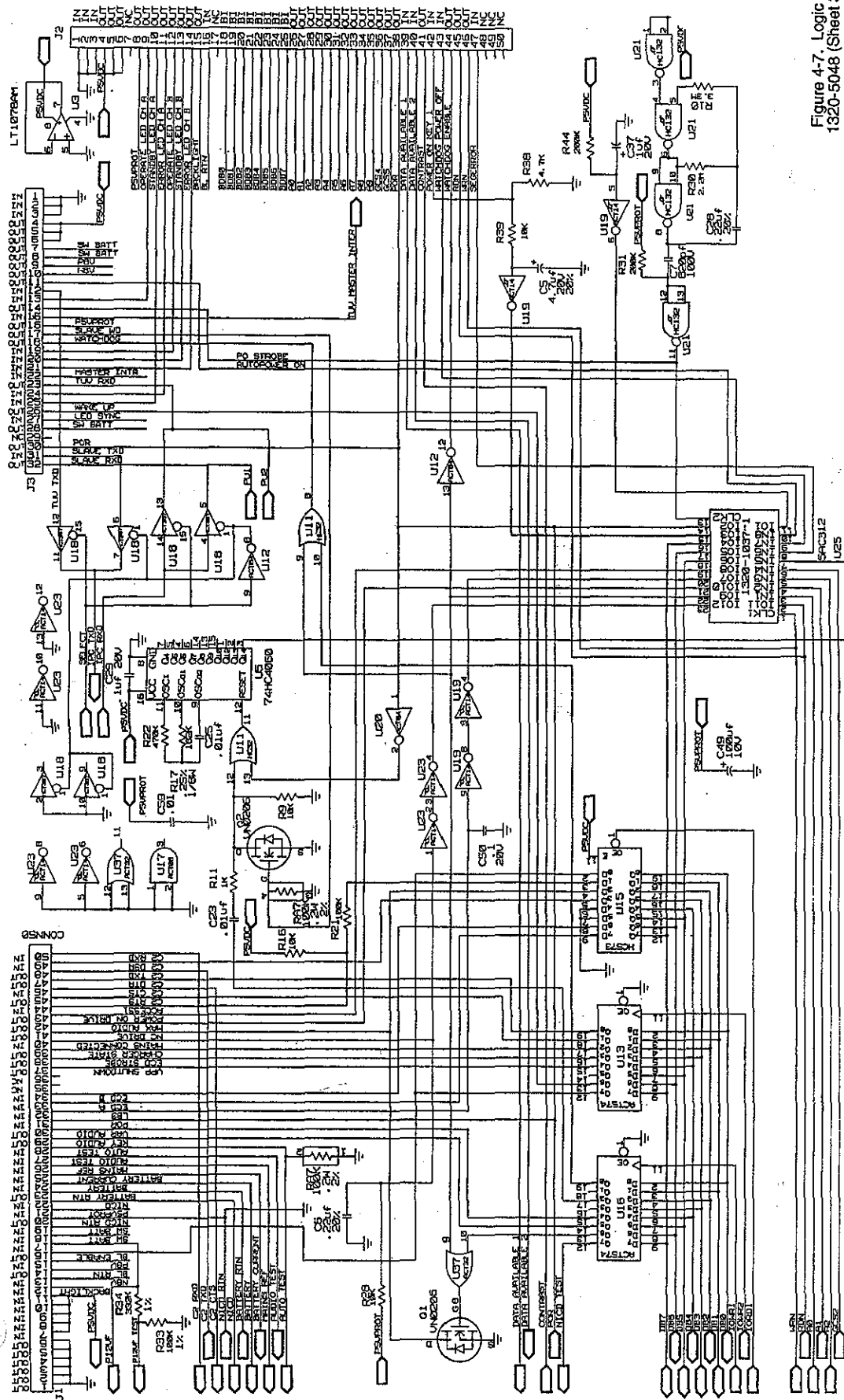


Figure 4-7. Logic Board
1320-5048 (Sheet 3 of 3)

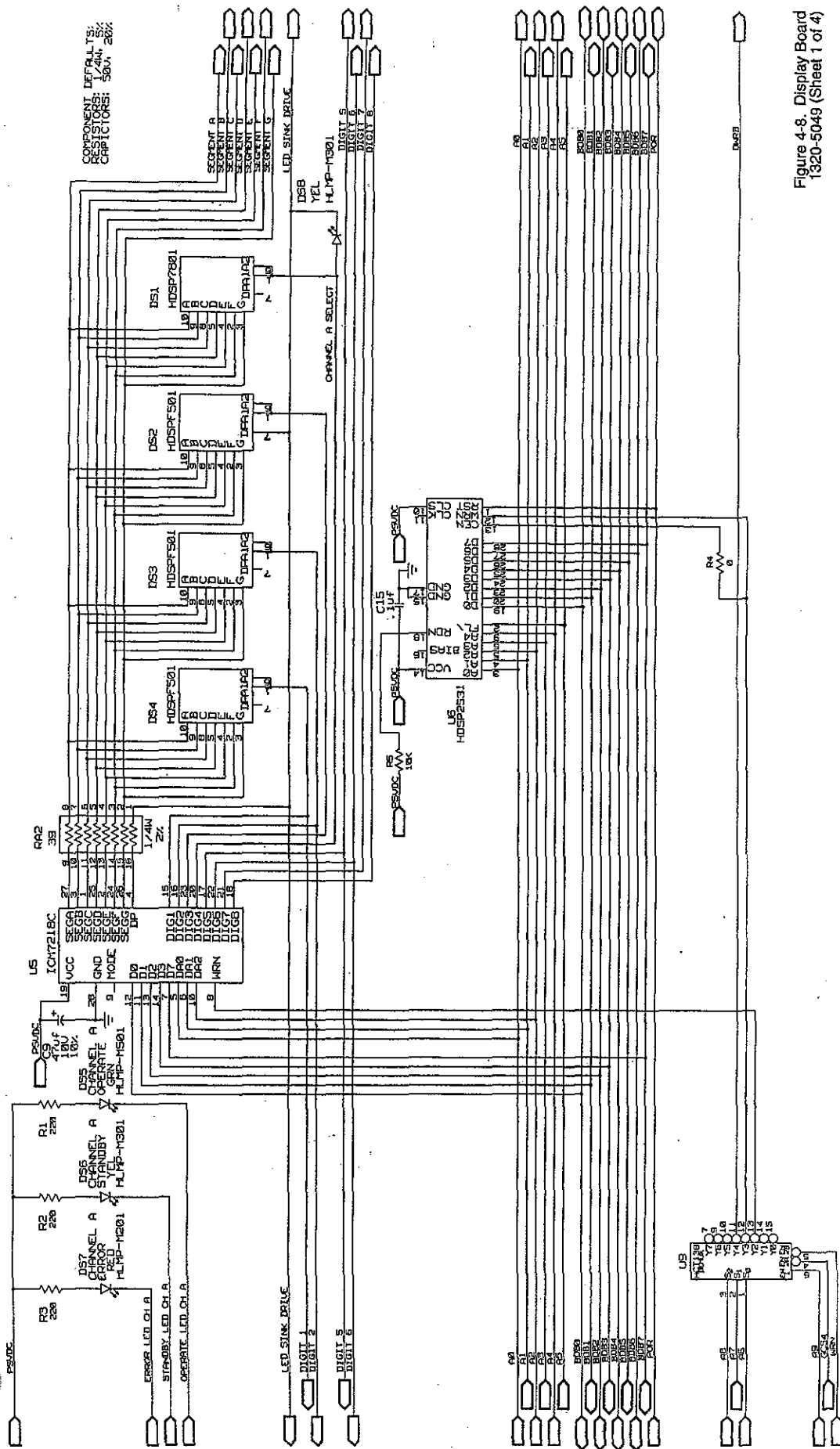


Figure 4-8. Display Board
1320-5049 (Sheet 1 of 4)

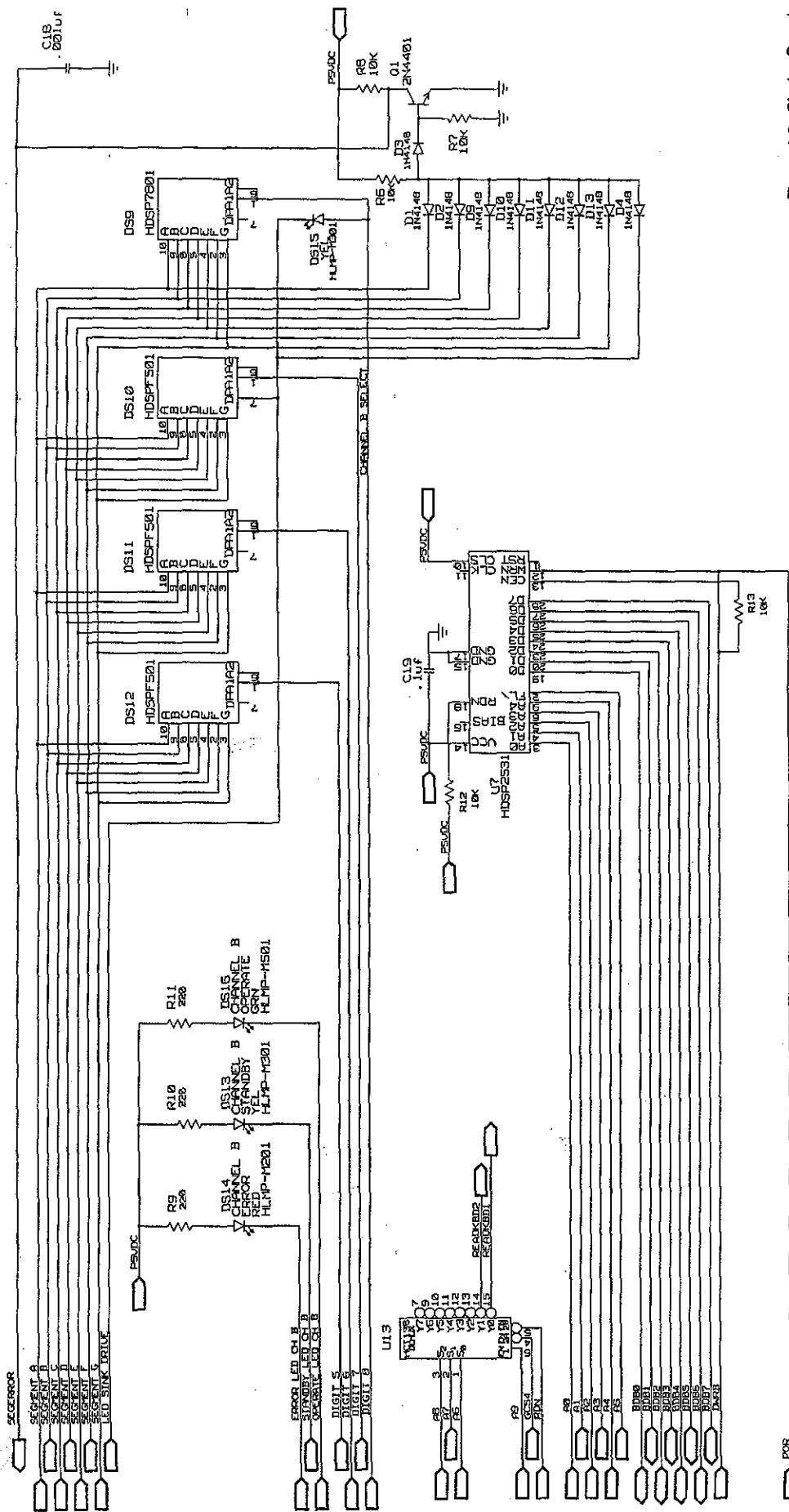


Figure 4-8. Display Board
1320-5049 (Sheet 2 of 4)

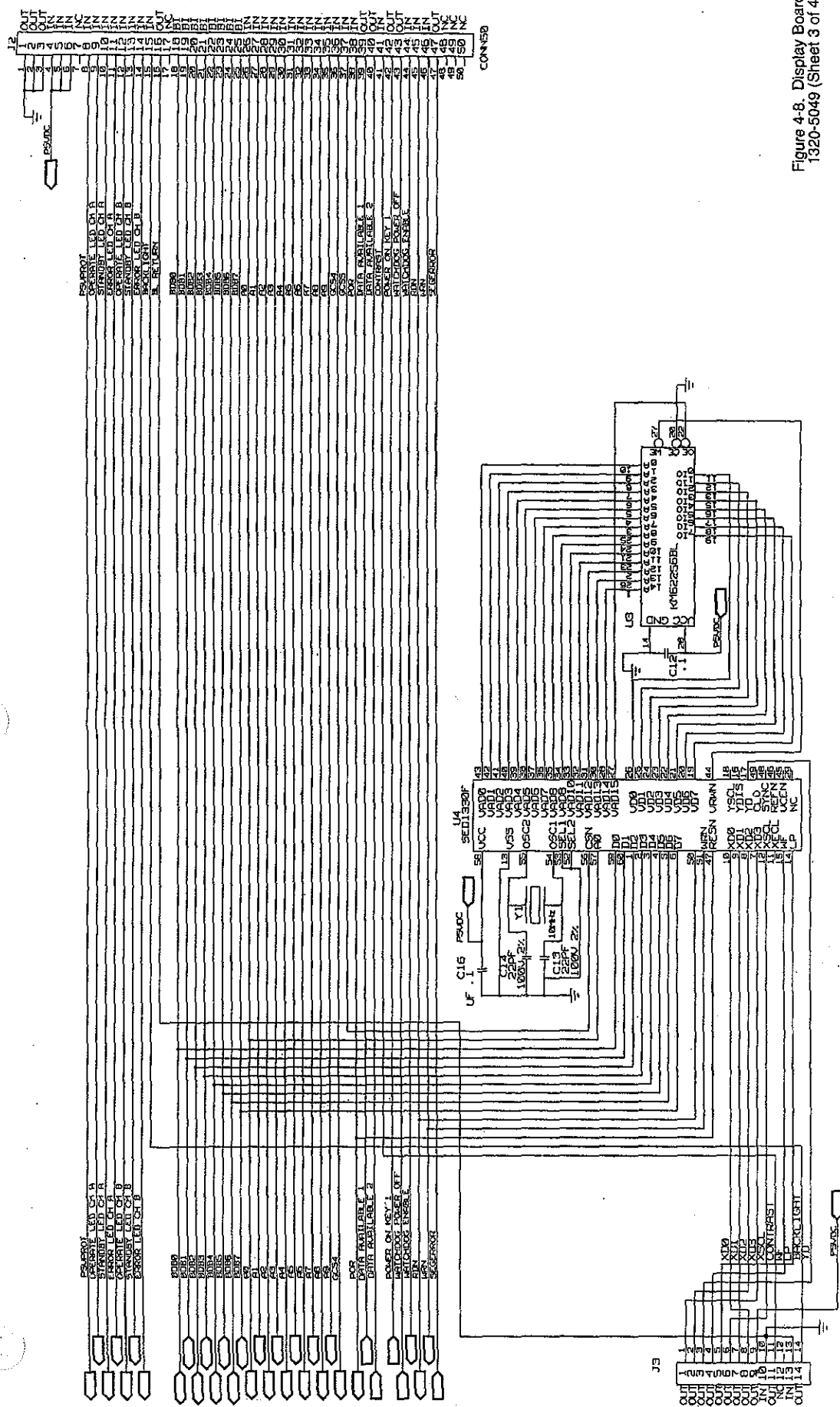
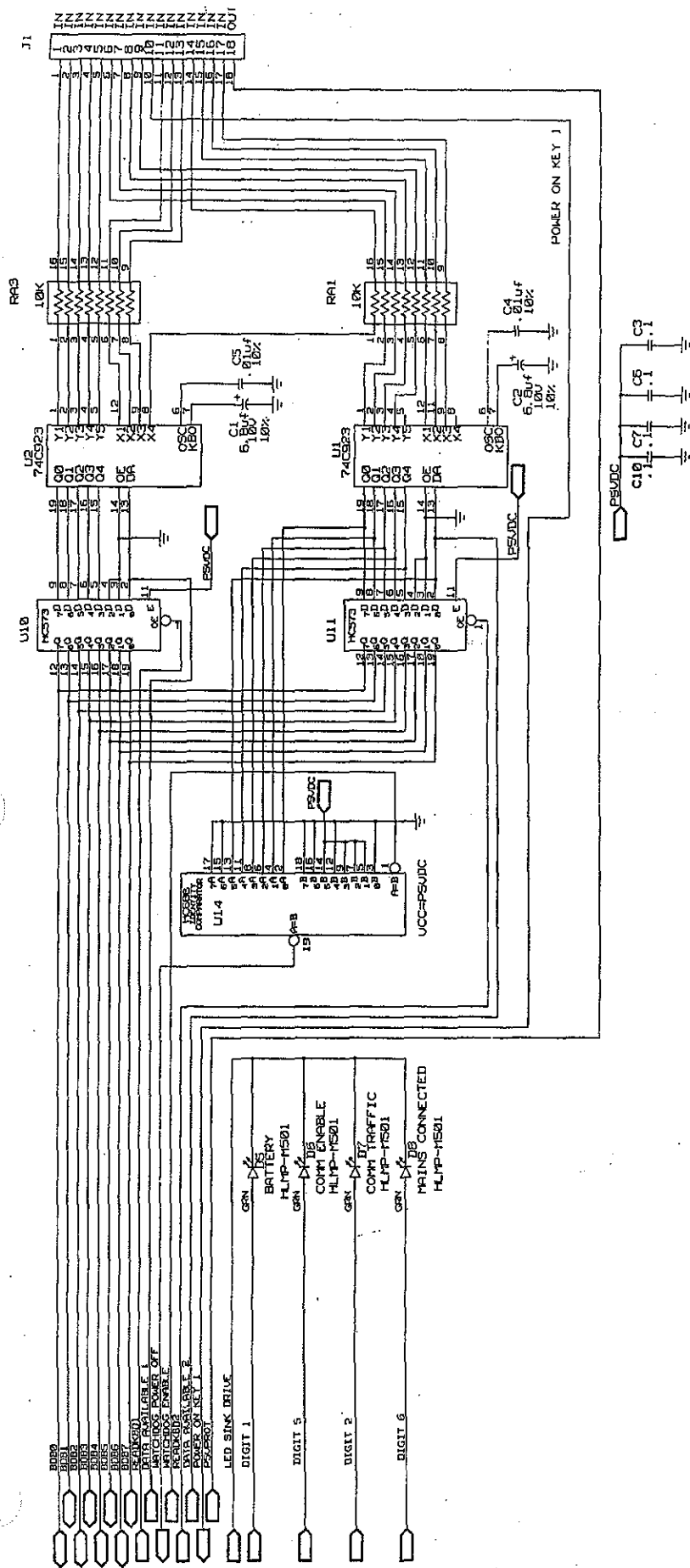


Figure 4-8. Display Board
1320-5049 (Sheet 3 of 4)



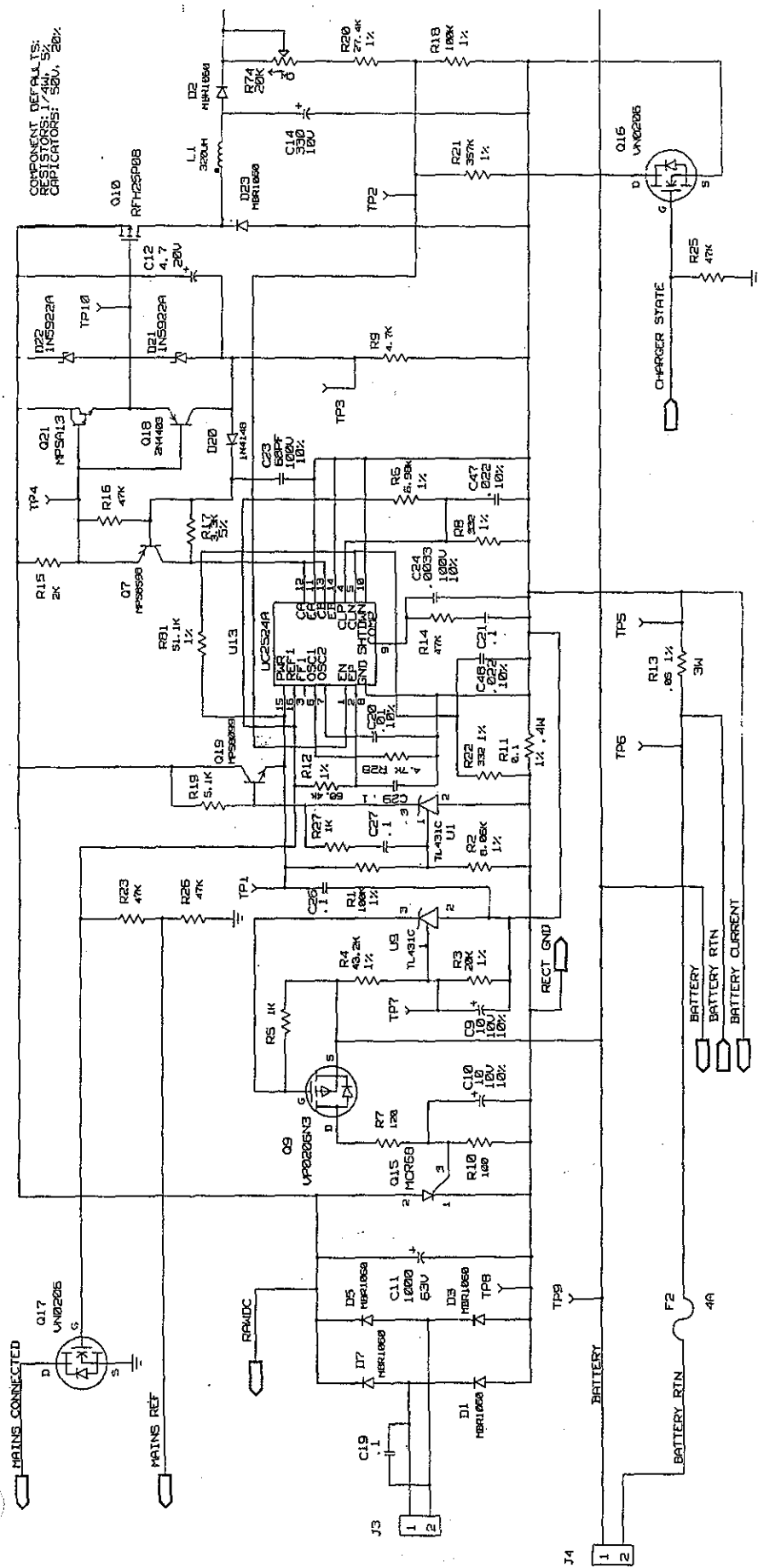


Figure 4-8. Power Supply Board
1320-5054 (Sheet 1 of 3)

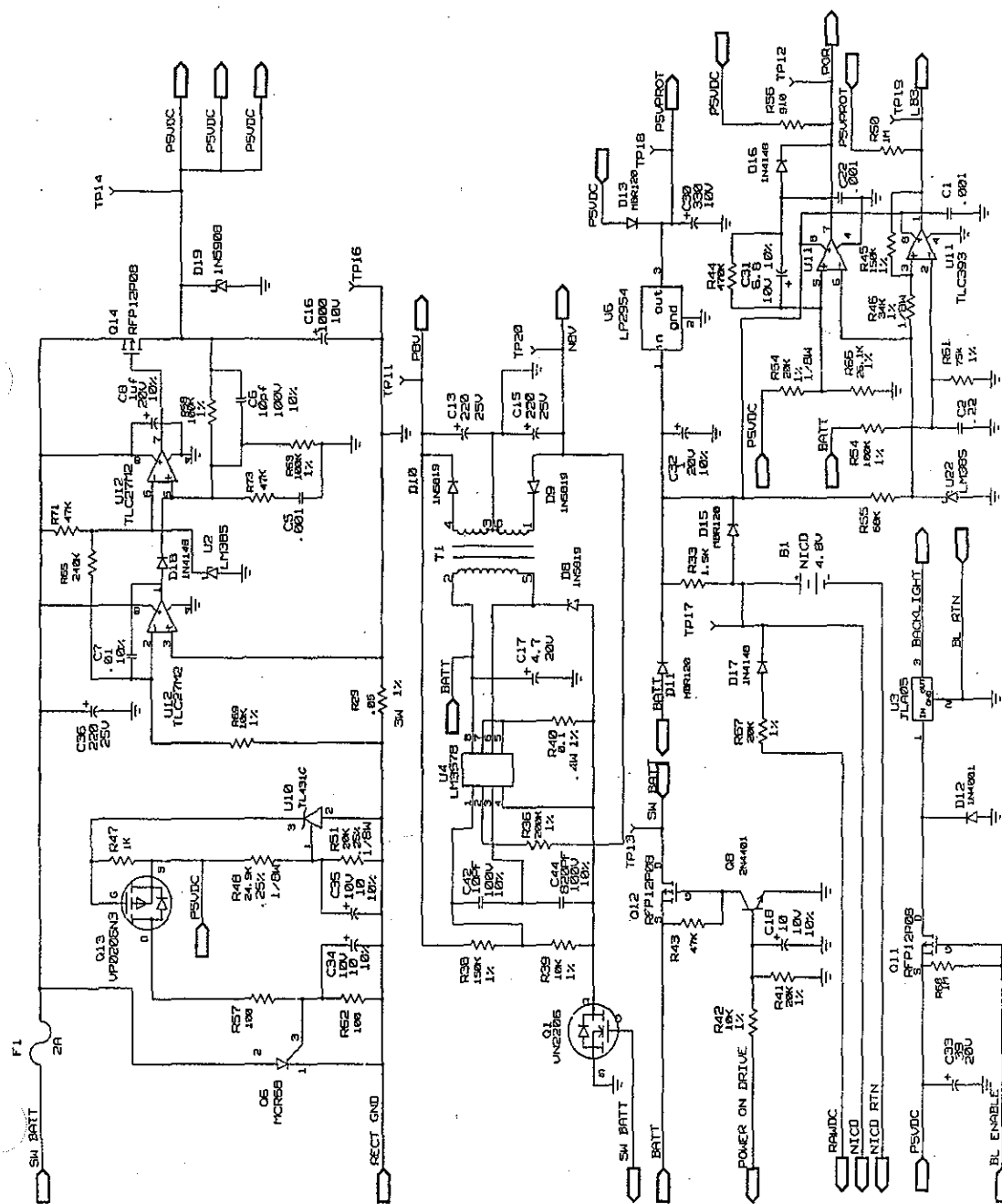


Figure 4-9. Power Supply Board
1320-5054 (Sheet 2 of 3)

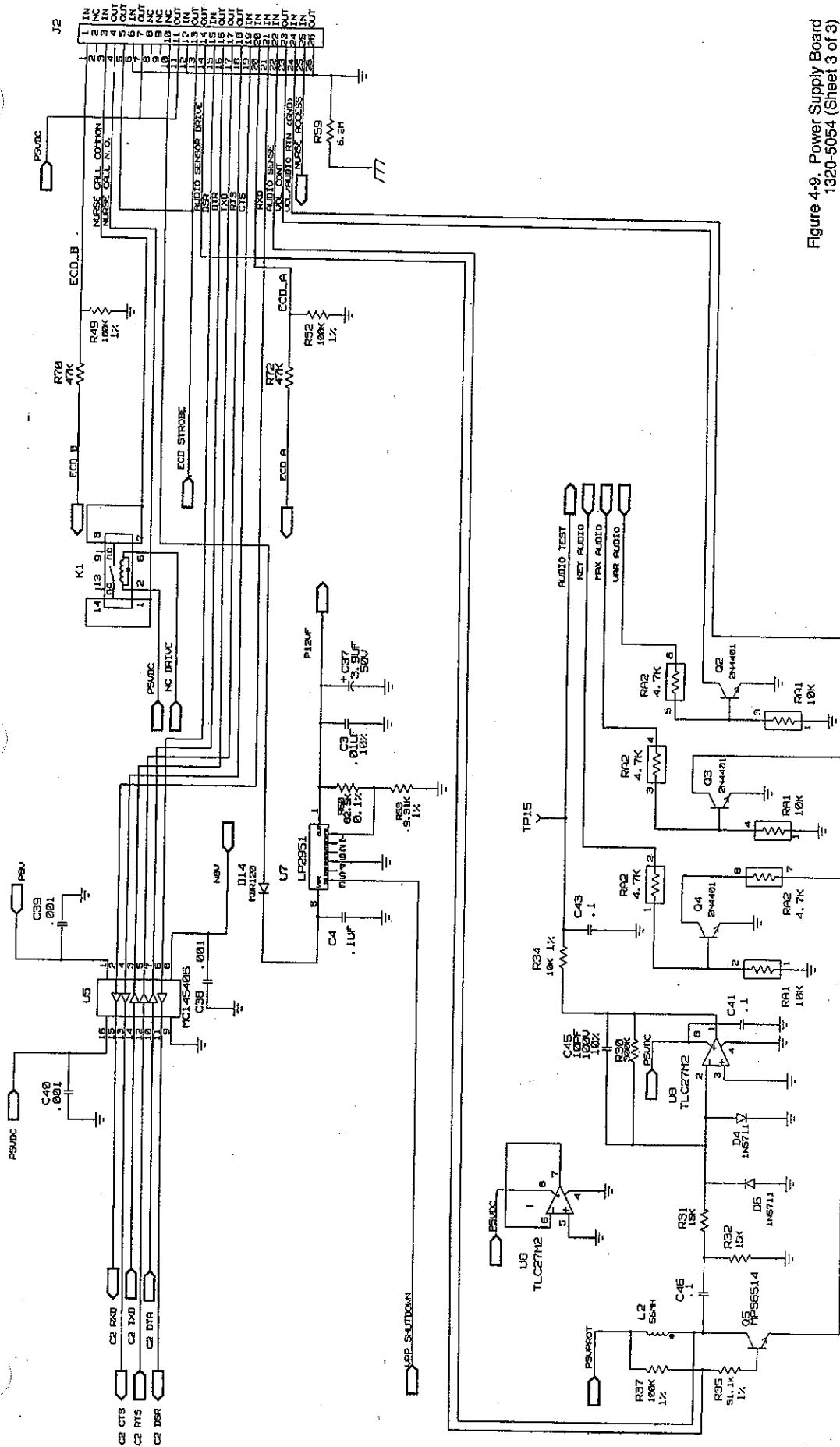


Figure 4-9. Power Supply Board
1320-5054 (Sheet 3 of 3)

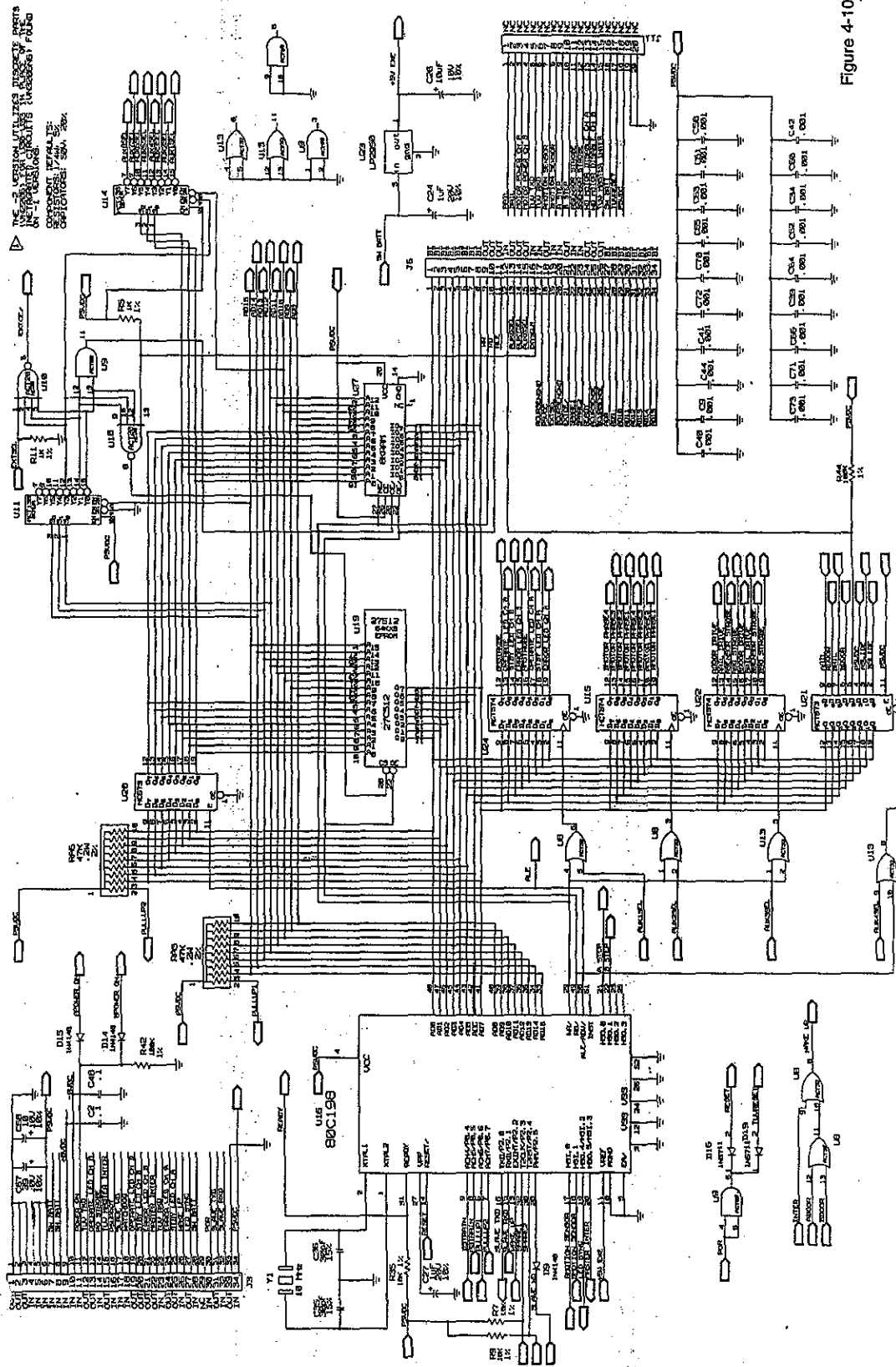


Figure 4-10. Motor Controller Board
1320-5001 (Sheet 1 of 3)

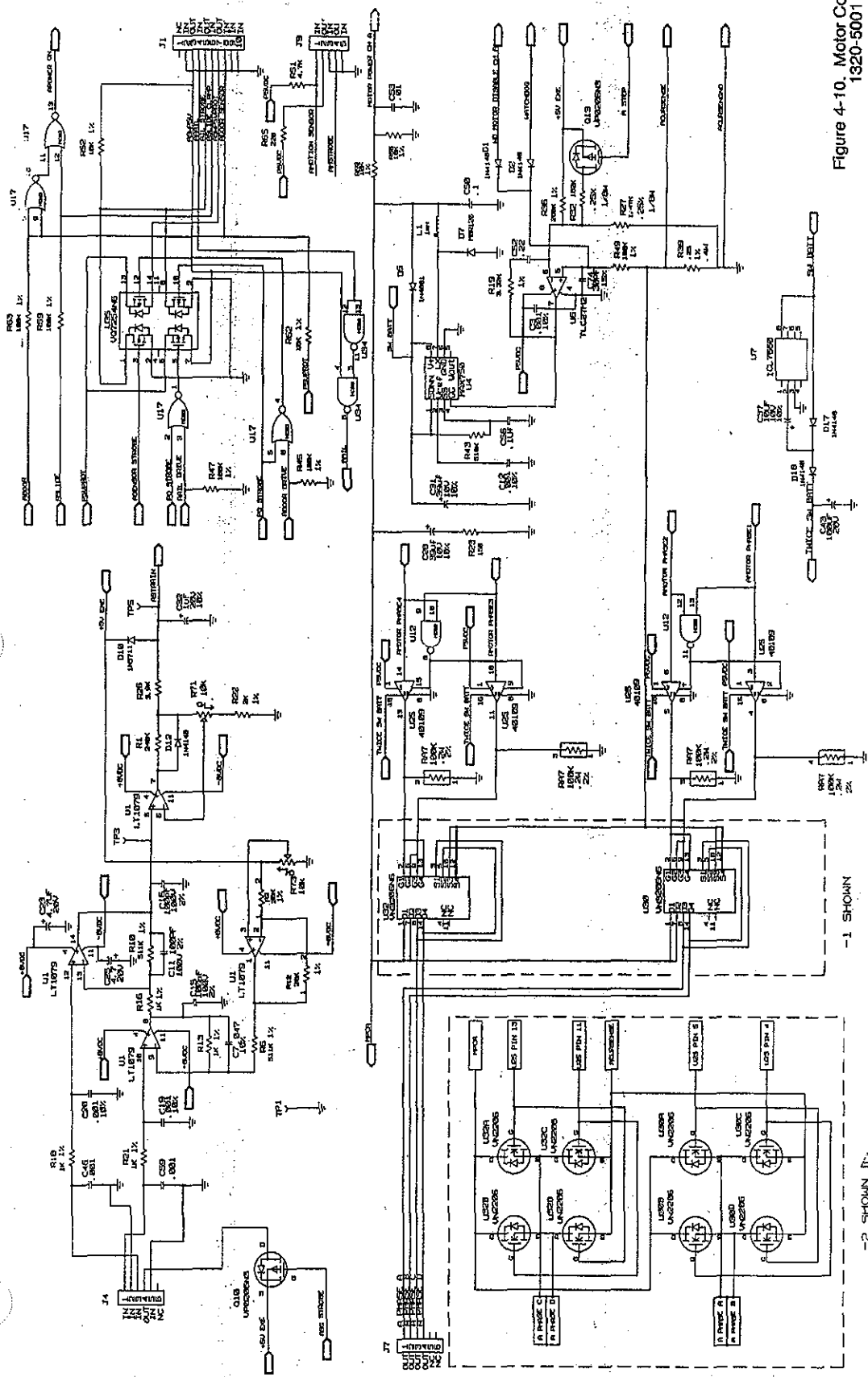


Figure 4-10. Motor Controller Board
1320-5001 (Sheet 2 of 3)

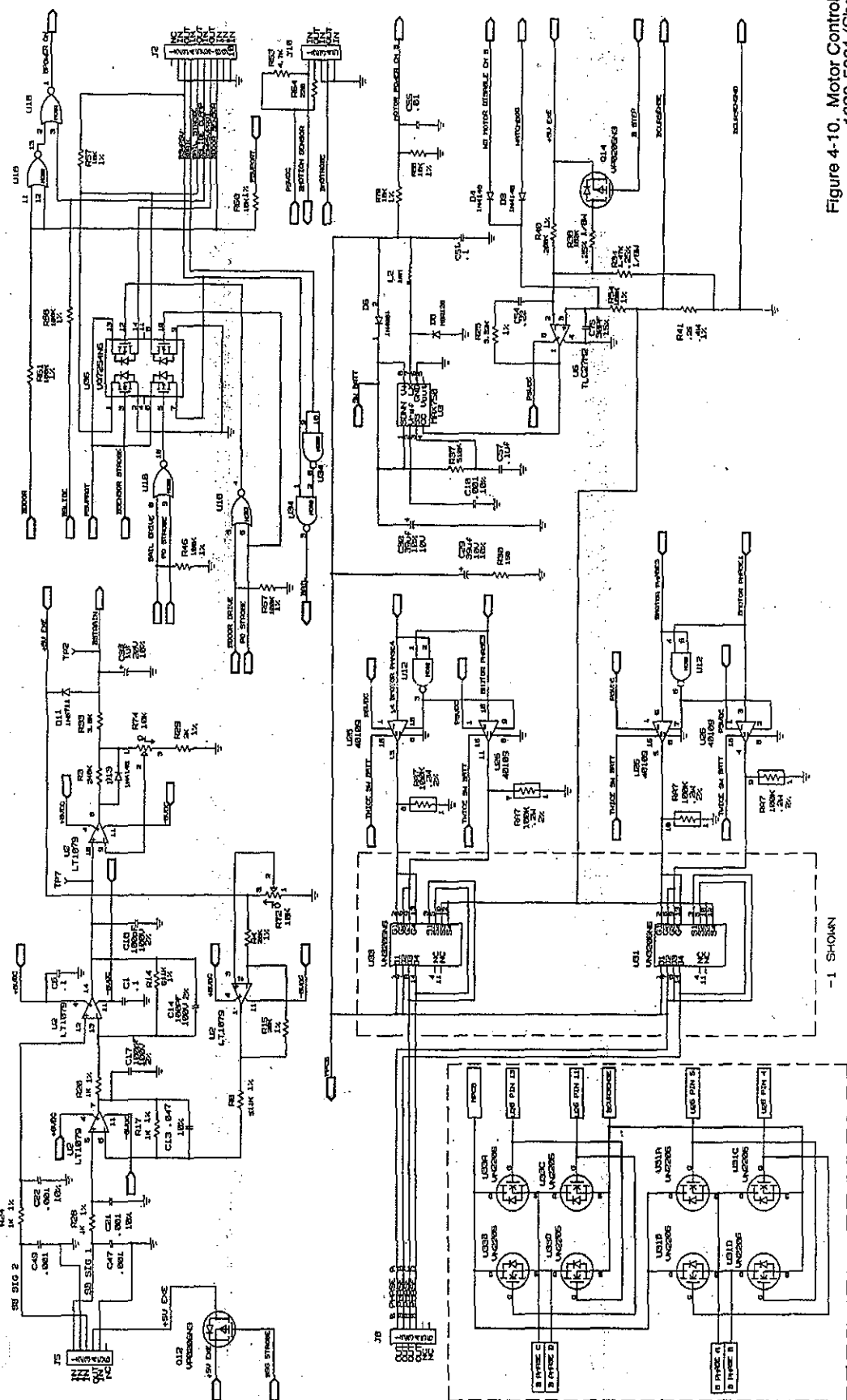


Figure 4-10. Motor Controller Board
1320-5001 (Sheet 3 of 3)

SECTION 5 - MAINTENANCE

5.1 INTRODUCTION

This section contains preventive maintenance instructions, maintenance mode operating procedures, troubleshooting routines, disassembly and reassembly procedures and a comprehensive operational performance test for the IMED® GEMINI PC-2TX® Volumetric Pump/Controller ("PC-2TX").

WARNING

Potentially lethal voltages are present within the PC-2TX case when the instrument is operated using external AC power. When the case is opened for maintenance action, it is recommended the instrument be operated using the internal battery.

CAUTION

Printed circuit boards (PCBs) are easily damaged when integrated circuits are removed and replaced. Excessive heat applied to the circuit board traces and pads can cause de-lamination of the metal foil and base material. Damage of that type is essentially irreparable; therefore, only low-temperature soldering irons and vacuum solder removal tools should be used when removing and replacing components on PCBs. Leads on integrated circuit components should be cut before attempting un-soldering and removal.

NOTE

CMOS devices are sensitive to static electrical charges and may be damaged during repair if the repair activity is not performed in an ESD protected environment using approved ESD protective procedures including personnel grounding.

5.2 PREVENTIVE MAINTENANCE

The PC-2TX is designed and assembled with the goal of minimizing maintenance requirements. The integral microprocessor incorporates a diagnostic routine that monitors the instrument's subsystems and operating parameters. Detection of operating system irregularities or failures that affect the instrument's functional operation activates audio and visual Alarms or Malfunction alerts for operator notification. Problems of this nature are recorded in the non-volatile RAM error log for subsequent use by biotechnical personnel in performing troubleshooting and repair actions.

Maintenance-free operation between regularly scheduled preventive maintenance inspections can be enhanced by performing routine cleaning on an 'as required' basis. The recommended interval for preventive maintenance inspections is once a year based on normal use and operation. Verification of proper operation is the responsibility of the user. At the user's option, such tests and verification may be performed at the factory at nominal cost. The following paragraphs describe in detail the procedures for performing general maintenance on the PC-2TX.

5.2.1 Cleaning Instructions

CAUTION

DO NOT SPRAY the instrument with any fluids. **DO NOT** immerse or stand the instrument in any fluids. Always unplug the AC power cord before cleaning. **DO NOT** attempt to sterilize with Ethylene Oxide gas, heat, steam, radiation, or autoclaving. To do so may damage the pump and void the warranty.

Exterior surfaces of the PC-2TX may be cleaned

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using any of the following recommended solutions. This list is considered adequate to permit cleanup of all expected contaminants.

Isopropyl alcohol
Warm soapy water
Household Bleach (10% solution, i.e. 1 part household bleach to 9 parts water)

Apply the solution with a soft lint free cloth, soft bristle brush, or cottonswab. Clean the Air-in-Line Detector groove, the elements behind the door, and the ECD's groove (if applicable), with cotton tipped swabs saturated with the solution. Disinfect using a non-staining, fungicidal, bacteriocidal, tuberculocidal solution.

Once the contamination has been removed, a cloth wet with fresh water should be used to rinse the entire pump to dilute and remove all residual cleaning/disinfecting solution. Repeat the rinse completely using another cloth moistened with fresh water. Following the two fresh water rinses, thoroughly dry the instrument with a soft, lint-free cloth. If this is not done the plastic could be damaged.

WARNING

Prior to connecting the AC power cord, ensure that the AC power connectors are clean of any residue and dried thoroughly. Check the cord contacts for contamination; if contaminated, remove residue or replace the power cord.

5.2.2 Mechanical Inspection

Perform the mechanical inspection described in Section 2.2 of this manual, plus the following checks:

- Inspect the urethane pumping seal for excessive wear and/or holes every 90 days or 1000 hours of instrument operating time. If damaged or worn, replace the seal.
- Perform a pumping mechanism extension spring integrity test by closing the IV set roller clamp while the pump is operating in the Pump mode. If only one spring is functioning the channel will not occlude. Replace damaged or missing spring.
- Inspect the exterior case, front and rear, for

holes, cracks, scratches, spalling, broken or damaged controls, missing components and/or screws.

- Inspect the green tinted windows covering the channel information displays and the screen covering the LCD for scratches or cracks.
- Ensure the pumping chamber access doors fit flush with the case at the top, bottom, and sides.
- Check the door handle/cam locks for ease of operation and flush fit with door when latched.
- Inspect the Air-in-line sensors and Flo-Stop® recesses for damage or obstructions.
- Install an approved IMED GEMINI administration set to ensure the Flo-Stop assembly seats correctly and the door closes and latches properly.
- Inspect the power cord for damage, bent prongs or deformed connector.
- Exercise the pole clamp mechanism to ensure freedom of movement.
- Check the Equipotential grounding point for damage and security.

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5.3 MAINTENANCE MODE

The PC-2TX is configured with a Maintenance Mode that allows biomedical technicians to access the software diagnostic subsystem.

5.3.1 Maintenance Mode Operation

WARNING

Prior to operating the PC-2TX in the Maintenance Mode, ensure that the instrument is not connected to a patient.

1. To initialize the instrument in the Maintenance Mode, press and hold the Audio Control switch on the rear panel and then press .

- Upon completion of initialization, the Central Information display will show the following screen:

Maintenance Mode

- [1] S/C board test and displays
- [2] M/C board tests and displays
- [3] Press [off] to exit

- To access the System Controller board Tests and Displays, press **1**:

- Central Information screen displays:

S/C Board Tests and Displays

- [1] error log display
- [2] ROM signatures
- [3] A/D voltages
- [4] audio tests

- Use the **↑** **↓** controls to toggle the display to the second and/or third screens, as shown below:

S/C Board Tests and Displays

- [5] NiCad battery voltages
- [6] Keypad test
- [7] IPC Log Download
- [8] Battery Statistics

S/C Board Tests and Displays

- [9] Discharge History

- To view the Error Log Display, press **1**:

- Central Information screen displays:

Error Log

```

index:      n
event:      xxx
time:       hh:mm:ss.ss
repeats:    n
    
```

where: n = index no. of entry (0 - 31)
 xxx = Error Code (100 - 9999)
 hh:mm:ss.ss - time of occurrence since power on
 r = number of times that error has repeated (0 - 65,536)

- Use **↑** **↓** controls to toggle forward or back through the error log. "No older entry" or "No newer entry" displays when all entries have been viewed.

- Press **CANCEL** to return to the S/C Board Tests and Display screen.

- To view ROM signatures screen, press **2**:

- Central Information screen displays:

ROM Signatures

```

CRC:                xxxx
checksum            xxxx
    
```

- The CRC value shows "wait" until the value is calculated, then the value is displayed as a hexadecimal value. The checksum is a redundant check to confirm ROM integrity.

- Press **CANCEL** once to return to the S/C Board Tests and Display screen.

7. To view A/D voltages display, press **3**:
- Central Information screen displays:



[*]

A/D Voltages

| | |
|-----------------|-------|
| mains: | x.xxV |
| V ref: | x.xxV |
| current: | x.xxA |
| system battery: | x.xxV |

Acceptable ranges:

mains: 0.00 to 0.10 volts (unplugged)
2.30 to 2.70 volts (plugged)
V ref: 2.5 ±0.125
current: -0.45 to -0.10 amps (unplugged)
0.00 to 1.25 amps (plugged in)
Sys batt: 6.8 to 7.5 volts (plugged in)

- Use   controls to toggle to second A/D voltage screen


[*]

A/D Voltages

| | |
|----------------|-------|
| NiCad battery: | x.xxV |
| flash program: | x.xxV |
| audio: | x.xxV |
| LCD contrast: | x.xxV |

Acceptable ranges:

NiCad batt: >5.00 <6.00 volts
flash prog: <1.00 volt
audio: variable (check for failure)
LCD cont: 1.5 ±0.5

8. Press  once to return to the S/C Board Tests and Display screen.

9. To view Audio Tests screen, press **4**:
- Central Information screen displays:

Audio Tests


| | | |
|---------------------|------|----|
| [1] no audio: | x.xx | ok |
| [2] key audio: | x.xx | ok |
| [3] variable audio: | x.xx | ok |
| [4] max audio: | x.xx | ok |

- Test runs when Audio test display is selected and can be re-run by pressing



Acceptable ranges:

| | |
|-----------------|-------|
| no audio: | <0.5 |
| key audio: | >0.85 |
| variable audio: | >0.85 |
| max audio: | >1.25 |

10. Press  once to return to the S/C Board Tests and Display screen.


11. To view NiCad battery voltages, press **5**:
- Central Information screen displays:

NiCad Battery Voltages

| | |
|-----------|------|
| unloaded: | x.xx |
| loaded: | x.xx |

Acceptable ranges:

| | |
|-----------|--------------|
| Unloaded: | 5.00 to 6.00 |
| Loaded: | 5.00 to 6.00 |

12. Press  once to return to the S/C Board Tests and Display screen.

13. To activate the Keypad Test, press **6**:
- Central Information screen displays:

Keypad Test

[key?]

- Press each keypad control:
 - The key name displays between the brackets (except CANCEL, which causes display to return to S/C Board Test and Display screen).

14. The IPC Download feature is for use by ALARIS Medical Systems internal use only.

15. To access Battery Statistics, press **8** :
- Central Information screen displays:

```

Battery Statistics
Accumulated Charge: x.xxxx Ah
Accumulated Discharge: x.xxxx Ah
Battery Level: OK
Battery Error: No Error
Charger Error: No Error
Capacity = x.xx Ah
<OPTIONS> Enter Capacity
<CLEAR> Resets Status
    
```

Acceptable ranges:

Accumulated Charge: N/A
 Accumulated Discharge: N/A
 Capacity: 12.00 Ah

16. To access Battery Discharge History, press **9** :

- Central Information screen displays:

```

Battery Discharge History
12.400 - 0      12.200 - 0
12.000 - 0      11.800 - 0
11.600 - 0      11.400 - 0
11.200 - 0      11.000 - 0
Threshold = 6.20V
Voltage = 7.39V
<CLEAR> Resets History
    
```

This screen indicates the depth to which the battery has been discharged by changing the 0 to 1 as each level is detected. The displayed threshold is the next lower undetected level. Displayed voltage is the current battery voltage.

17. Press **CANCEL** once to return to the S/C Board Tests and Display screen or twice to return to Maintenance Mode screen.
18. To access the M/C Board Tests and Displays, press **2** :
- Central Information screen displays:

M/C Board Tests and Displays

[1] maximum pressure test

[2] strain beam voltages

19. To perform maximum pressure test, press **1** :
- Central Information screen displays:

```

Maximum Pressure Test
[A] halted    x.xx
[B] halted    x.xx
[C] halted    x.xx
[D] halted    x.xx
    
```

20. Install a GEMINI disposable in the channel pumping mechanism and connect the distal end to a 0-60 psi (0-400 kPa) pressure gauge.
Note: Use water for this test.

21. Press **A** then press **START** :
- "running" will replace "halted" for channel A on the Central Information display screen.
 - Allow pump to operate until the pressure stabilizes at the highest obtainable pressure.
 - Record the stabilized pressure reading. This reading should be ≥ 17 psi (117.3 kPa).

Note

If test fails, replace mechanism.

22. Press **CHANNEL OFF**.
23. Release the pressure in the tubing, and repeat the test as necessary for the other channels.
24. Press **CANCEL** to return to the M/C Board Tests and Display screen.
25. To access the Strain Beam Voltage test screen, press **2** :
- Central Information screen displays:

```

Strain Beam Voltages
[A] homed      x.xx
[B] .....
    
```

- Channel A pumping mechanism homes - "homings" displays for channel A

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- "homed" and "x.xx" (strain beam voltage value for channel A) display.

26. Press **B** to check the strain beam voltage for the other channels.
27. Press **CANCEL** once to return to the M/C Board Tests and Display screen or twice to return to the Maintenance Mode screen.
28. Press **3** to exit maintenance mode, then press **CHANNEL OFF** to power down.

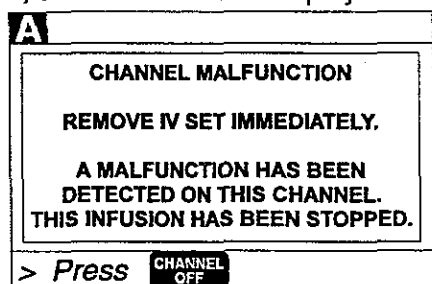
5.4 TROUBLESHOOTING

The troubleshooting routines presented in the Table 5-1 are correlated directly to the maintenance mode test sequence described in section 5.3.

5.4.1 Mechanism Alarm Circuit (M.A.C.)

The PC-2TX instruments are manufactured with a pump mechanism alarm circuit (M.A.C.) to enhance detection of impact damage to the instrument as the result of dropping or other abnormal handling.

If a PC-2TX goes into an alarm condition following Power On, check the Central Display:



This alarm condition is associated with a disconnect in the pump mechanism alarm circuit. To determine the specific problem, perform the following troubleshooting procedures.

- a. Turn off the instrument and remove the AC power cord from the AC outlet.
- b. Separate the case (refer to Maintenance Manual Section 5.5.1).
 - Use a 5/32" Allen driver or wrench to remove the four socket head screws that connect the front and rear case assemblies. (Do not leave screws on work surface. Front panel could be damaged if front case is laid on the screws).

NOTE

When separating and positioning the front and rear cases for M.A.C. installation, ensure that no tension is applied to the harnesses connecting the case assemblies.

- c. Inspect the upper and lower M.A.C. assembly contacts on each pump mechanism for a disconnected condition.
- d. If the M.A.C. contacts (spring clips) are in place, inspect the M.A.C. wires and connectors for a cut or break.
- e. If the M.A.C. circuit is intact, then the alarm condition can be attributed to an AIL hardware problem. Follow maintenance manual procedures for troubleshooting, removal and replacement of the AIL/SCD assembly.
- f. If the M.A.C. contacts are disconnected, the instrument has been subjected to an abnormal impact condition. Visually inspect the pump mechanism(s) for severe cracks or breaks in the housing pivot area and mechanism mounting brackets. Small cracks do not affect functionality.
- g. If no visual damage is detected, attempt to move the top of the pump mechanism laterally (side to side). If the mechanism is intact, there will be very little lateral motion. If the mechanism is broken, the lateral movement will be easily discernible.

NOTE

Do not mistake movement of the top of the pump mechanism along the hinge axis as lateral movement.

- h. If the mechanism is intact, with no severe cracks or breaks, inspect the M.A.C. components for obvious damage; e.g., severely bent copper components. If all components are intact and undamaged, reconnect the upper and lower M.A.C. spring clips.

NOTE

It is important that the M.A.C. spring clips be compressed only the amount necessary to allow the contacts to be inserted into the slots on the top plate.

- i. If a mechanism is severely cracked or broken, or if the M.A.C. system is damaged, replace the damaged components.

Table 5-1. Troubleshooting Guide

| Test/Fault | Probable Cause | Corrective Action |
|---|------------------------------------|--|
| INITIALIZATION | | |
| LEDs fail to illuminate at power up | Battery <4.76 volts | Connect AC power |
| | F1 on Power Supply PCB blown | Replace fuse |
| | F2 on Power Supply PCB blown | Replace fuse |
| | POWER ON switch inoperative | Check keypad cable connector |
| | | Test/Replace keypad |
| | Digital Logic failure | Replace Digital Logic Board |
| Unable to enter Maintenance Mode | ACCESS switch failure | Replace ACCESS switch |
| | ACCESS switch harness disconnected | Reconnect ACCESS switch harness |
| LEDs stay on | Digital Logic failure | Replace Digital Logic Board |
| Display Corrupted | Digital Logic Board failure | Replace Digital Logic Board |
| | Display Board failure | Replace Display Board |
| ERROR LOG DISPLAY | | See Table 5-2 for a listing of Error Log Codes |
| A/D VOLTAGES | | |
| "mains:" reading <1.25 volts | Power Supply Board failure | Replace Power Supply Board |
| "V ref:" reading other than 2.50 ±0.02 | Digital Logic Board failure | Replace Digital Logic Board |
| "current:" reading other than = <4.00 depending on batter charge; plugged in ≈ -0.200 unplugged | Power Supply Board failure | Replace Power Supply Board |
| | Digital Logic Board failure | Replace Digital Logic Board |
| "system battery:" reading 6.8 - 7.5 volts | System Battery failure | Replace System Battery |
| | Power Supply Board failure | Replace Power Supply Board |
| | Digital Logic Board failure | Replace Digital Logic Board |

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| Test/Fault | Probable Cause | Corrective Action |
|---|---|-------------------------------|
| AUDIO TESTS | | |
| "No audio:" reading other than <0.137 volts | Power Supply Board audio oscillator circuit failure | Replace Power Supply Board |
| "Key audio:" reading >0.500 | Audio Transducer failure | Replace Audio Transducer |
| | Power Supply Board Audio oscillator circuit failure | Replace Power Supply Board |
| "Variable audio:" reading >0.500 | Audio Control Switch failure | Replace Audio Control Switch |
| | Audio Transducer failure | Replace Audio Transducer |
| | Power Supply Board failure | Replace Power Supply Board |
| | Audio Transducer failure | Replace Audio Transducer |
| "Max audio:" reading >1.25 | Power Supply Board audio oscillator circuit failure | Replace Power Supply Board |
| No audio adjust | Audio Control Switch failure | Replace Audio Control Switch |
| NiCad BATTERY VOLTAGE | | |
| "Loaded:" reading other than >5.00 | NiCad Battery needs charging | Connect AC power |
| | NiCad Battery failure | Replace NiCad battery |
| "Unloaded:" reading >5.00 but <6.00 | NiCad Battery needs charging | Connect AC power |
| | NiCad Battery failure | Replace NiCad battery |
| KEYPAD TEST | | |
| Key/Display Mismatch or Invalid Key | Keypad failure | Replace Keypad |
| | Decoder failure | Replace Digital logic Board |
| MAXIMUM PRESSURE TEST | | |
| Motor stopped when "running" is displayed | Motor Harness disconnected | Connect Motor Harness |
| | Motor failure | Replace Motor |
| | Analog Board failure | Replace Analog Board |
| | Digital Board failure | Replace Digital Board |
| Motor continues to run when "halted" is displayed | Motion Sensor harness disconnected | Connect Motion Sensor Harness |
| | Motion Sensor failure | Replace Motion Sensor |
| | Digital Logic Board failure | Replace Digital Logic Board |

| Test/Fault | Probable Cause | Corrective Action |
|--|--|---|
| STRAIN BEAM VOLTAGES | | |
| | A or B strain beam reading >0.1, set not installed | Strain Beam out of calibration Recalibrate Strain Beam (see Section 7.3) |
| | Strain Beam failure | Replace Strain Beam |
| A or B strain beam reading <0.8 or >2.2 with dry set installed | Digital Logic Board failure | Replace Digital Logic Board |
| | Strain Beam out of calibration | Recalibrate Strain Beam (see Section 7.3) |
| | Strain Beam failure | Replace Strain Beam |
| | Digital Logic Board failure | Replace Digital Logic Board |
| Motor continually runs | Calibrated Tubing | Replace Calibrated Tubing (See Section 1.7) |
| | Motion Sensor harness disconnected | Reconnect Motion Sensor Harness |
| | Motion Sensor failure | Replace Motion Sensor |
| | Digital Logic Board failure | Replace Digital Logic Board |

Table 5-2. PC-2TX Error Log Codes

The Error Codes listed below represent the results of software initiated subsystem tests. The tests are evaluated on Pass/Fail logic with an error code generated for a fail condition. The Error Code prefix (x) identifies the specific channel with the problem, in accordance with the following coding: 1xx for Channel A and 2xx for Channel B. Malfunction types are categorized as follows with their respective instrument responses:

Channel Malfunction:

- Appropriate error code is placed in the Event and Error logs
- "Channel Malfunction" message appears on the Central Display
- Alarm LEDs flash for affected channel
- "- - - -" flashes in the rate display for the affected channel
- Audio alarm is sounded
- All controls are disabled except channel select and STOP controls
- Pressing CHANNEL OFF turns the channel off.

Board Malfunction:

- Appropriate error code is placed in the Event and Error logs
- "Channel Malfunction" message appears on the Central Display
- Alarm LEDs flash for affected channel
- "- - - -" flashes in the rate display for the affected channel
- Audio alarm is sounded
- All controls are disabled except channel select and STOP controls
- Pressing CHANNEL OFF turns the channel off.

System Malfunction:

- Appropriate error code is placed in the Event and Error logs
- "System Malfunction" message appears on the Central Display
- Alarm LEDs flash for affected channel
- "- - - -" flashes in the rate display for the affected channel
- Audio alarm is sounded
- All controls are disabled except channel select and CHANNEL OFF controls
- Pressing CHANNEL OFF turns the channel off.

| Code No. | Description | Malfunction | Probable Cause |
|---|---------------------------------|---|---|
| The following error codes are channel specific with 1xx pertaining to channel A and 2xx to channel B. | | | |
| x00 | Analog-Digital (runtime) | Channel Malfunction. At power-up (and during every subsequent runtime A/D conversion), after completing an A/D reading, an A/D interrupt is programmed. Failure to detect this interrupt within a prescribed time frame will cause an A/D conversion error. | Motor Controller Board (processor) |
| x01 | AIL Sensor (runtime) | Channel Malfunction. During runtime, the Motor Controller software detects a failure of the AIL sensor. | AIL/Slide Clamp Harness AIL Board Motor Controller Board |
| x02 | Door Sensor (runtime) | Channel Malfunction. During runtime, the Motor Controller software detects a failure of the door sensor. | Door Harness Assembly Motor Controller Board Door Sensor Interface |
| x03 | Motor Revolution Time (runtime) | Channel Malfunction. During runtime, the Motor Controller software detects the actual time required to complete a pumping mechanism revolution differs from calculated value by $\pm 12\%$ for a 3 revolution sample. | Sticking pumping mechanism Motor Controller Board |
| x04 | Motor Speed (runtime) | Channel Malfunction. Motor Controller software has detected an out of range motor speed variable (divide-by-zero error). | Pumping Mechanism |
| x05 | Motor Sync. Off (runtime) | Channel Malfunction. Motor Controller software has detected when an error $>1.5\%$ in a sample of 50 motor revolutions is detected by the motion sensor. | Pumping Mechanism |
| x06 | Motor Table (runtime) | Channel Malfunction. Motor Controller software has detected a calculation error in a motor table value $>200\text{msec}$. | Motor Controller Board (processor failure) |
| x07 | No Motor Sync. (runtime) | Channel Malfunction. Occurs 120 motor steps after the motion sensor fails to confirm motor sync. The motion sensor is inoperative or the motor is not turning. | Pumping Mechanism Motor Controller Board |
| x08 | Strain Beam (runtime) | Channel Malfunction. Occurs when the Motor Controller software does not detect $\geq 100\text{ mV}$ variance between the highest and lowest readings during the 2nd revolution of pumping mechanism after starting an infusion. | Strain Beam Assembly Motor Controller Board Battery Supply Board (switch battery circuitry) |
| x09 | Channel Fault (runtime) | Channel Malfunction. Motor Controller (MC) software during runtime has detected a "status" differential between its condition and that provided by System Controller (SC) software that has persisted for 2 consecutive transactions (or 2 seconds). | Logic Board Motor Controller Board Software Error * |

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| Code No. | Description | Malfunction | Probable Cause |
|----------|--------------------------------------|---|--|
| x10 | Slide Clamp Sensor (startup/runtime) | Channel Malfunction. Motor Controller software during startup or runtime has detected three consecutive failures of the slide clamp circuitry test. | AIL Board AIL/SCD harness Motor Controller Board |
| x11 | Motion Sensor (startup/runtime) | Channel Malfunction. Motor Controller software has detected two consecutive failures of the motion sensor circuitry test. | Motion Sensor Motor Controller Board Pumping Mechanism |
| x12 | Illegal Infusion Request (runtime) | Channel Malfunction. Motor Controller software during runtime has detected one or more of four illegal infusion conditions: Maintenance Mode mismatch; KVO flag detected, but rate is not at KVO rate; VTBI All mode is set, but VTBI field contains a value; or if the motor controller is in a fault state. | Motor Controller Board Software Error * |

The following series 5xx error codes pertain to the PC-2TX's Motor Controller Board.

| | | | |
|-----|-----------------------------|--|---|
| x00 | Invalid Error Type | Board Malfunction. Motor controller software reported an error outside of the boundaries of active error codes. A corrupt data transfer of a valid error message has occurred. | Motor Controller Board Software Error * |
| x01 | Startup ROM Error (runtime) | Board Malfunction. ROM test calculates a CRC on the entire ROM. A mismatch between test and precalculated ROM CRC has occurred. | Motor Controller Board |
| x02 | Startup RAM Error | Board Malfunction. Start up RAM test fails verification. | Motor Controller Board |
| x03 | Startup Testing Error | Board Malfunction. Motor Controller software failed to complete all of its startup testing. | Motor Controller Board Software Error * |
| x04 | Runtime ROM Error | Board Malfunction. ROM CRC mismatch between runtime cumulated sample total and startup ROM CRC. | Motor Controller Board |
| x05 | Runtime RAM Error | Board Malfunction. Runtime RAM test fails verification. | Motor Controller Board |
| x06 | Timebase Error | Board Malfunction. Motor controller software has not detected a "sync" signal from the System controller for 2 seconds. | Logic Board Motor Controller Board Oscillator |
| x07 | Controller State Error | Board Malfunction. (Watchdog alarm may result). Motor controller software has detected a routine range check to be outside of predicted boundaries. | Motor Controller Board |
| x08 | Extinct Malfunction 8 | | Software Error * |
| x09 | Extinct Malfunction 9 | | |
| x10 | Case Error | | |

| Code No. | Description | Malfunction | Probable Cause |
|----------|--------------------------------|--|---|
| x11 | General Error | Board Malfunction. (Watchdog alarm may result). Motor controller software has detected an unexpected event or instruction. | Logic Board |
| x12 | Execution Fault | | Motor Controller Board (processor failure) |
| x13 | Extinct Malfunction 13 | | Oscillator Software Error * |
| x14 | Version No. Mismatch (startup) | Board Malfunction. At startup Motor Controller software has detected a mismatch between sent and expected software version numbers. | Incompatible software versions installed (EPROM) |
| x15 | MC Stuck Bits 0 | Board Malfunction. The motor controller software routinely performs range checks on internal data, internal message traffic format and content, and other system parameters. If any of this data falls outside of it's predicted boundaries, an error is reported. | Logic Board |
| x16 | MC Stuck Bits 1 | | Motor Controller Board |
| x17 | MC Stuck Bits 2 | | Software Error * |
| x18 | MC Stuck Bits 3 | | |
| x19 | MC Stuck Bits 4 | | |
| x20 | MC Stuck Bits 5 | | |
| x21 | MC Stuck Bits 6 | | |
| x22 | MC Stuck Bits 7 | | |
| x23 | MC Stuck Bits 8 | | |
| x24 | MC Stuck Bits 9 | | |
| x25 | MC Stuck Bits 10 | | |
| x26 | MC Stuck Bits 11 | | |
| x27 | MC Stuck Bits 12 | | |
| x28 | MC Stuck Bits 13 | | |
| x28 | MC Stuck Bits 14 | | |
| x30 | Extinct Malfunction 30 | | |
| x70 | Homing While Infusing | Board Malfunction. The motor controller software routinely performs range checks on internal data, internal message traffic format and content, and other system parameters. If any of this data falls outside of it's predicted boundaries, an error condition exists. | Logic Board Motor Controller Board Software Error * |
| x71 | Watchdog IPC Silence A | Board Malfunction. (Watchdog alarm is generated (loud continuous tone). The System Controller software and Motor Controller software exchange status information at 1 second intervals. As the Motor Controller (MC) software receives status from the System Controller (SC), it compares the received status information against it's own status. If there is a disagreement, a counter is started to indicate the disagreement. Disagreements will be normal at times due to message propagation delays between the two processors, but they should not persist for more than a safe time interval. | Logic Board |
| x72 | Watchdog IPC Silence B | | Motor Controller Board |
| x73 | Watchdog Bad Mode Req | | Software Error * |
| x74 | Watchdog Alarm OFF | | |
| x75 | Watchdog Alarm ON | | |
| x76 | Watchdog Flo-Stop OFF | | |
| x77 | Watchdog Flo-Stop ON | | |
| x78 | Watchdog Infusing OFF | | |
| x79 | Watchdog Infusing ON | | |
| x80 | Watchdog Low Flow OFF | | |
| x81 | Watchdog Low Flow ON | | |

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| Code No. | Description | Malfunction | Probable Cause |
|----------|-------------------------|--|------------------------|
| x82 | Watchdog KVO OFF | Board Malfunction. (Watchdog alarm is generated (loud continuous tone). The System Controller software and Motor Controller software exchange status information at 1 second intervals. As the Motor Controller (MC) software receives status from the System Controller (SC), it compares the received status information against it's own status. If there is a disagreement, a counter is started to indicate the disagreement. Disagreements will be normal at times due to message propagation delays between the two processors, but they should not persist for more than a safe time interval. | Logic Board |
| x83 | Watchdog KVO ON | | Motor Controller Board |
| x84 | Watchdog Fault OFF | | Software Error * |
| x85 | Watchdog Fault ON | | |
| x86 | Watchdog Stealth OFF | | |
| x87 | Watchdog Stealth ON | | |
| x88 | Watchdog All OFF | | |
| x89 | Watchdog All ON | | |
| x90 | Watchdog Fract OFF | | |
| x91 | Watchdog Fract ON | | |
| x92 | Watchdog PSI OFF | | |
| x93 | Watchdog PSI ON | | |
| x94 | Watchdog Pump State OFF | | |
| x95 | Watchdog Pump State ON | | |
| x96 | Watchdog INF Step OFF | | |
| x97 | Watchdog INF Step ON | | |
| x98 | Watchdog Reset Stealth | | |
| x99 | Watchdog INF Stealth | | |

Error Codes beginning with 700 and subsequent relate to System errors.

| | | | |
|-----|-----------------------------------|---|--|
| 700 | ROM Checksum Error (startup) | System Malfunction. The flash loader code calculates and stores the ROM checksum into a NVRAM location (STARTUP_ROM_CHECKSUM). After the pump is flashed, this checksum may be displayed (using maintenance mode), and the value hard-coded into romcheck.asm (ROM_CHECKSUM). At power-up, the NVRAM and ROM checksum values are compared against each other and a disagreement causes an error to be reported. | EPROM Logic Board |
| 701 | Analog to Digital Error (startup) | System Malfunction. At power-up, an A/D converter test is performed as part of a suite of system hardware tests. An A/D reading is requested from each of the 8 A/D channels. If the converter is unable to perform a conversion and return EOC within 150µsec on any channel, an A/D failure is reported. | Logic Board A/D Circuitry Oscillator |
| 702 | V _{REF} Error (startup) | System Malfunction. At power-up, an A/D voltage reference test reading is taken. If the resultant reference voltage falls outside of the 2.5V ±12% range, an A/D failure is reported. | Logic Board A/D Circuitry |

| Code No. | Description | Malfunction | Probable Cause |
|----------|--|---|--|
| 703 | NiCad Differential Error (startup) | System Malfunction. At power-up, a NiCad battery test is performed as part of a suite of system hardware tests. First, the load is attached followed by a 30msec delay to permit the voltage to stabilize. Five loaded battery voltage readings are averaged. Next, the load is detached followed by a 30 msec delay to permit the voltage to stabilize. Five unloaded battery voltage readings are averaged. If the difference between loaded and unloaded voltages fails to meet the required minimum (20mV), a NiCad difference error is reported. | Battery Power Supply Board Logic Board Power Supply/Logic Board inter-connect harness |
| 704 | NiCad Voltage Level Error (startup) | System Malfunction. At power-up, a NiCad battery test is performed as part of a suite of system hardware tests. Five "loaded" NiCad battery voltage readings are averaged, and if the average voltage is below 4.45 volts (Low Battery 2), a NiCad level error is reported. | Battery Power Supply Board Logic Board Power Supply/Logic Board inter-connect harness |
| 705 | Startup Audio Error (detected at power-up) | System Malfunction. At power-up, an audio test is performed as part of a suite of system hardware tests. Each audio level is asserted (i.e. max, variable, key, silence), and then after a delay time elapses, an A/D reading is taken. This reading is then compared against a pre-defined limit. If any of these limits are exceeded, an error is reported. | Power Supply Board Logic Board Power Supply/Logic inter-connect harness Audio Sensor Audio potentiometer |
| 706 | System Battery Low (startup) | System Malfunction. The A/D converter is used to read the voltage level from the battery. If the voltage reading indicates the battery level is below 5.4 volts (LB2), a System Low Battery condition is reported. | Battery A/C fuse Logic Board (A/D) |
| 707 | System Battery High (startup) | System Malfunction. The A/D converter is used to read the voltage level from the battery. If the voltage reading indicates the battery level is above 7.75 volts (LB2), a System High Battery condition is reported. | Power Supply Board Logic Board (A/D) |
| 710 | Runtime RAM Error (runtime) | System Malfunction. The runtime RAM test exercises pieces of RAM and verifies that the RAM location can hold an assigned pattern. A Butterfly, Inverse Butterfly, All Ones and All Zeroes pattern are each written to the location, and then verified. If any of these tests fail, a runtime RAM failure is reported. | Logic Board |
| 711 | Runtime ROM Error (runtime) | System Malfunction. The runtime ROM test continuously "walks" through ROM, calculating partial CRCs. Once the entire ROM has been covered, the final CRC is compared to the CRC calculated at power up time. If there is a mismatch, a ROM failure is reported. | Logic Board |

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| Code No. | Description | Malfunction | Probable Cause |
|----------|-----------------------------|---|---------------------------------|
| 713 | S/C Watchdog (runtime) | System Malfunction. Every 5 seconds, the System Controller services the watchdog. Before the watchdog is asserted however, system health must be verified. If the results of the runtime ROM or RAM test fail, or if all expected tasks have not executed within the last 5 seconds, then a watchdog malfunction is declared. Note: The runtime ROM and RAM tests go to system malfunction as soon as a failure is detected, so the Task qualifier check is the most likely the source of this malfunction. | Logic Board (processor failure) |
| 723 | Action Fault | System Malfunction. The system controller software routinely performs range checks on internal data, internal message traffic format and content, and other system parameters. If any of this data falls outside of it's predicted boundaries, an error is reported. | Logic Board |
| 724 | Illegal Parameter Fault | | Motor Controller Board |
| 725 | ITC Sender Fault | | Software Error * |
| 726 | Unknown Status Message | | |
| 727 | Illegal Startup Data 0 Cmd | | |
| 728 | Illegal Startup Data 1 Cmd | | |
| 729 | Conversion Error | | |
| 730 | Switch 1 Fault | | |
| 731 | Switch 2 Fault | | |
| 732 | Get Messages is Null | | |
| 733 | Get Messages Illegal NON FB | | |
| 734 | Get Messages illegal FB | | |
| 735 | IPC Main Null FB PTR | | |
| 736 | Filled Block Alloc Failure | | |
| 737 | ITCGET MSGPTRIS Null | | |
| 738 | Illegal Audio Arguments | | |
| 739 | Audio State Error | | |
| 740 | Illegal Argument Value | | |
| 741 | Contrast Range Error | | |
| 742 | Switch 1 Fault | | |
| 743 | Cursor Range Fault | | |
| 744 | Display OFF ARG Range Error | | |
| 745 | Display ON ARG Range Error | | |
| 746 | Overlay ARG Range Error | | |
| 747 | System Set ID Error | | |
| 748 | Draw Box Illegal ARG | | |
| 749 | Draw Icon Illegal ARG | | |
| 750 | Draw Line Illegal ARG | | |

| Code No. | Description | Malfunction | Probable Cause |
|----------|-------------------------------|--|----------------------------|
| 751 | Erase Illegal ARG | System Malfunction. The system controller software routinely performs range checks on internal data, internal message traffic format and content, and other system parameters. If any of this data falls outside of it's predicted boundaries, an error is reported. | Logic Board |
| 752 | Erase Illegal ARG | | Motor Controller Board |
| 753 | Fill Illegal ARG | | Software Error * |
| 754 | Scroll Set ID Error | | |
| 755 | Cursor Illegal ARG | | |
| 756 | Print Null String PTR | | |
| 757 | Set Font Illegal ARG | | |
| 758 | Switch 1 Fault | | |
| 759 | Switch 2 Fault | | |
| 760 | Schedule Illegal PTR | | |
| 761 | Schedule No More Blocks | | |
| 762 | Delete Service Illegal Timer | | |
| 763 | Pause Service Illegal Timer | | |
| 764 | Resume Service Illegal Timer | | |
| 765 | Restart Service Illegal Timer | | |
| 766 | Timer 2 Queue Err | | |
| 767 | Initial Rate Illegal ARG | | |
| 768 | Rate Illegal ARG | | |
| 769 | Bad Segment | | |
| 770 | Blank Rate Illegal ARG | | |
| 771 | Canned Rate Illegal ARG | | |
| 772 | Set LED Illegal ARG | | |
| 773 | CHID Disp Illegal ARG | | |
| 774 | CHID Brightness Illegal ARG | | |
| 775 | CHID Brightness Illegal ARG | | |
| 776 | Initial CHID Disp Illegal ARG | | |
| 778 | Key Down Illegal Value | System Malfunction. The system controller software routinely performs range checks on internal data, internal message traffic format and content, and other system parameters. If any of this data falls outside of it's predicted boundaries, an error is reported. | Keypad Software Error * |
| 784 | Read AD Illegal ARG | System Malfunction. The system controller software routinely performs range checks on internal data, internal message traffic format and content, and other system parameters. If any of this data falls outside of it's predicted boundaries, an error is reported. | Logic Board |
| 785 | Power ON Source Illegal | | Motor Controller Board |
| 786 | Battery Charge Level Illegal | | Software Error * |
| 787 | Test NiCad Value Illegal | | |
| 789 | Read Date Time Illegal ARG | System Malfunction. The system controller software routinely performs range checks on internal data, internal message traffic format and content, and other system parameters. If any of this data falls outside of it's predicted boundaries, an error is reported. | Logic Board |
| 790 | Read RTC DateTime Read Fail | | Motor Controller Board |
| 791 | Set Date Time Illegal ARG | | Software Error * |
| 792 | Set Time Illegal ARG | | |
| 793 | Set Alarm Illegal ARG | | |

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| Code No. | Description | Malfunction | Probable Cause |
|----------|------------------------------|--|---|
| 794 | Delete Alarm Illegal ARG | System Malfunction. The system controller software routinely performs range checks on internal data, internal message traffic format and content, and other system parameters. If any of this data falls outside of it's predicted boundaries, an error is reported. | Logic Board Motor Controller Board Software Error * |
| 795 | Set Time Execute Illegal ARG | | |
| 796 | Del Time Execute Illegal ARG | | |
| 797 | Find Alarm Slot Failure | | |
| 798 | Get Update Entry Failure | | |
| 799 | S Main Switch 1 Fault | | |
| 800 | S Main Switch 2 Fault | | |
| 801 | Illegal PRI Infusion Request | | |
| 802 | Illegal SEC Infusion Request | | |
| 803 | Illegal Delay Start Request | | |
| 804 | Illegal Drug Calc Request | | |
| 805 | Illegal Multidose Request | | |
| 806 | Start Switch 1 Fault | | |
| 807 | Util1 Switch 1 Fault | | |
| 808 | Util4 Switch 1 Fault | | |
| 809 | Util4 Switch 2 Fault | | |
| 810 | Util4 Switch 3 Fault | | |
| 812 | CMDS Draw 1 Illegal ARG | System Malfunction. The system controller software routinely performs range checks on internal data, internal message traffic format and content, and other system parameters. If any of this data falls outside of it's predicted boundaries, an error is reported. | Logic Board Motor Controller Board Software Error * |
| 813 | CMDS Draw 2 Illegal ARG | | |
| 814 | CMDS Erase Illegal ARG | | |
| 815 | CMDS Update Illegal ARG | | |
| 816 | CMDS Setmask Illegal ARG | | |
| 817 | CMDS Illegal Command ID | | |
| 818 | ECD Connected Illegal ARG | | |
| 819 | Container Empty Illegal ARG | | |
| 820 | Clobbered Function PTR | | |
| 821 | Ch Alarm Switch 1 Fault | | |
| 822 | Ch Alarm Illegal Alarm | | |
| 823 | Ch Alarm Switch 2 Fault | | |
| 824 | Ch CMD Switch 1 Fault | | |
| 825 | Ch CMD Switch 2 Fault | | |
| 826 | Ch CMD Rate Display Blanks | | |
| 827 | Ch CMD Rate Display Error | | |

| Code No. | Description | Malfunction | Probable Cause |
|----------|--------------------------------|--|------------------------|
| 828 | Ch CMD Dashes Display Error | System Malfunction. The system controller software routinely performs range checks on internal data, internal message traffic format and content, and other system parameters. If any of this data falls outside of it's predicted boundaries, an error is reported. | Logic Board |
| 829 | Ch CMD Switch 3 Fault | | Motor Controller Board |
| 830 | Ch CMD Switch 4 Fault | | Software Error * |
| 831 | Ch MON IPC Timeout | | |
| 832 | Ch MON VTBI Accuracy Error | | |
| 833 | Ch STATS Infusion Type Error | | |
| 834 | Ch STATS Switch 1 Fault | | |
| 835 | Ch STATS MC Rate Error | | |
| 836 | Ch STATS MC VTBI Error | | |
| 838 | CH STATS MC Not Halted Error | | |
| 839 | Ch STATS MC Internal State Err | | |
| 840 | CH STATS MC Mode Error | | |
| 841 | Ch STATS MC Ready Error | | |
| 842 | Ch STATS MC Infusing Error | | |
| 843 | Ch STATS MC KVO Error | | |
| 844 | Ch STATS MC Alarm Error | | |
| 845 | Ch STATS MC Malfunction Error | | |
| 846 | Ch STATS Switch 2 Fault | | |
| 847 | Ch STATS MC STBY LED Error | | |
| 848 | Ch STATS MC Run LED Error | | |
| 849 | Ch STATS MC Alarm LED Error | | |
| 850 | Ch STATS MC Maint Mode Err | | |
| 851 | Ch STATS Switch 3 Fault | | |
| 852 | Ch STATS Switch 4 Fault | | |
| 853 | Ch STATS Switch 5 Fault | | |
| 854 | UI Util3 Switch 1 Fault | | |
| 873 | SYSCHALM Chan Alarm Fault | System Malfunction. The system controller software routinely performs range checks on internal data, internal message traffic format and content, and other system parameters. If any of this data falls outside of it's predicted boundaries, an error is reported. | Logic Board |
| 874 | SYSCHST Channel State Fault | | Motor Controller Board |
| 875 | SYSDEVST Device State Fault | | Software Error * |
| 876 | SYSRATE Rate Fault | | |
| 877 | SYSVTBI VTBI Fault | | |
| 878 | Ch STATS VTBI Int Error | | |
| 879 | Ch STATS VTBI Frac Error | | |
| 880 | SYSVINP Primary VINP Fault | | |
| 881 | SYSVINP SEC VINP Fault | | |
| 882 | SYSSETUP Setup Fault | | |
| 883 | SYSSTART Start Time Fault | | |
| 884 | SYSPATWT Patient Wt Fault | | |
| 885 | SYSDEVST Illegal Powerdown | | |
| 886 | Ch MGR Data IPC Silence | | |

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| Code No. | Description | Malfunction | Probable Cause |
|----------|--------------------------------------|---|--|
| 887 | Ch MGR State IPC Silence | System Malfunction. The system controller software routinely performs range checks on internal data, internal message traffic format and content, and other system parameters. If any of this data falls outside of it's predicted boundaries, an error is reported. | Logic Board |
| 888 | RTC DRV Read RAM Time Read Failure | | Motor Controller Board |
| 889 | RTC DRV Read Time Illegal ARG | | Software Error * |
| 890 | RTC DRV Get Run Time Secs Failure | | |
| 891 | Ch CMD SC Pri Rate Error | | |
| 892 | Ch CMD SC Pri VTBI Error | | |
| 893 | Ch CMD SC Sec Rate Error | | |
| 894 | Ch CMD SC Sec VTBI Error | | |
| 902 | Ch STATS MC All Mode | System Malfunction. The system controller software routinely performs range checks on internal data, internal message traffic format and content, and other system parameters. If any of this data falls outside of it's predicted boundaries, an error condition is reported. | Logic Board |
| 903 | Ch STATS VI Total Negative Error | | Motor Controller Board |
| 904 | Ch STATS VI Dif Negative Error | | Software Error * |
| 906 | Ch STATS Rep VI Total Negative Error | | |
| 910 | Bad INT Unexpected Interrupt | System Malfunction. The system controller processor automatically interrupts software execution, if an unexpected event or instruction is encountered. | Logic Board (processor failure) |
| 911 | Bad INT Divide Error Interrupt | | Software Error * |
| 912 | Bad INT Single Step Interrupt | | |
| 913 | Bad INT NMI Interrupt | | |
| 914 | Bad INT Breakpoint Interrupt | | |
| 915 | Bad INT Overflow Interrupt | | |
| 916 | Bad INT Array Bounds Interrupt | | |
| 917 | Bad INT Unused OpCode Interrupt | | |
| 918 | Bad INT ESC OpCode Interrupt | | |
| 919 | Malfuncnt ISR Sleep Fault | System Malfunction. The system controller software routinely performs range checks on internal data, internal message traffic format and content, and other system parameters. If any of this data falls outside of it's predicted boundaries, an error is reported. | Logic Board |
| 920 | S MDREV Illegal Multidose Start | | Motor Controller Board Software Error * |
| 1000 | C2 DRV Init Cable Report Failure | System Malfunction. The system controller software routinely performs range checks on C2 communications internal data, internal message traffic format and content, and other parameters. If any of this data falls outside of it's predicted boundaries, an error is reported. | C2 cable (or connections) |
| 1001 | C2 DRV Cable Report Failed | | C2 port, circuitry or connections |
| 1002 | C2 DRV RX Frame Report | | Software Error * |
| 1003 | C2 DRV Frames Sent MSG Failed | | |
| 1004 | C2 DRV Error Report Failed | | |
| 1005 | C2 DRV Frame Too Long Report Failed | | |
| 1006 | C2 DRV Buffer Alloc Error | | |
| 1007 | C2 DRV Buffer Free1 Error | | |
| 1008 | C2 DRV Buffer Free2 Error | | |
| 1009 | C2 DRV Buffer Free3 Error | | |
| 1010 | SYSC2ST C2 State Range | | |

| Code No. | Description | Malfunction | Probable Cause |
|----------|---------------------------------|---|-----------------------------------|
| 1011 | SYSC2ST C2 State Fault | System Malfunction. The system controller software routinely performs range checks on C2 communications internal data, internal message traffic format and content, and other parameters. If any of this data falls outside of it's predicted boundaries, an error is reported. | C2 cable (or connections) |
| 1012 | S CCMAIN Switch 1 Fault | | C2 port, circuitry or connections |
| 1013 | S CCMAIN Switch 2 Fault | | Software Error * |
| 1015 | C2 BUF Switch 1 Fault | | |
| 1016 | C2 MGR Unexpected ITC Message | | |
| 1017 | C2 MGR Port Status Type Error | | |
| 1018 | C2 MSG C@ Port BUF Alloc Failed | | |
| 1019 | C2 MSG C2 Port BUF Free Failed | | |
| 1020 | C2 MSG MSG State Fault | | |
| 1021 | C2 QRY Infusion Type Error | | |
| 1022 | C2 QRY2 Channel State Error | | |

* Software Diagnostics. If this condition is detected in field use, please contact your local ALARIS Medical Service Office for further information.

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5.5 DISASSEMBLY

The following procedures are presented in a sequence that provides the most efficient means of accessing and removing the subassemblies that comprise the PC-2TX pump/controller.

CAUTION

Before attempting to disassemble the PC-2TX, unplug the AC power cord from the wall outlet, remove the power cord retention bracket and disconnect the cord from the rear of the case and check that the instrument is in the power off condition. SEE THE WARNING UNDER REASSEMBLY PARAGRAPH 5.6 BEFORE REATTACHING THE AC POWER CORD TO THE INSTRUMENT.

NOTE

It is recommended that all maintenance actions be performed on an anti-static surface, preferably a grounded anti-static mat.

5.5.1 Separating the Case (Figure 6-1)

Prior to removing the screws which mate the front and rear case assemblies, it is necessary to stabilize the rear case. Insert a 7 inch (18 cm) long piece of 1 to 1.25 inch (3.2 cm) round stock (dowel or PVC pipe) in the pole clamp so the bottom of the stock rests on the working surface. Tighten the pole clamp. This brace will prevent the rear case from falling over once the front case is detached.

NOTE

The rear case is unstable when disconnected from the front case due to the location of the battery within the rear case. Should the rear case fall, the multi-card assembly could be damaged by forces exerted through the various harness assemblies connected to the circuit boards.

1. Use a 5/32" Allen driver or wrench to remove the four socket head screws that connect the front and rear case assemblies. (Do not leave screws on work surface. Front panel could be damaged if front case is laid on the screws).
2. Carefully separate the front and rear case assemblies along the right side (as viewed from the rear) of the instrument. Use a #1 Phillips screwdriver to disconnect the left and right side ground harness cables from the threaded end of the door latch anchor bracket.

3. Disconnect the logic board interface cable from connector J1 on the power supply board.

The front and rear cases are now physically and electrically separated and each can be disassembled independently.

5.5.2 Front Case Disassembly (Figure 6-2)

The following disassembly procedures are predicated on complete disassembly of the front case. Several front case assemblies are not directly accessible and require sequential disassembly for access. Those assemblies are identified with a note addressing the prerequisite procedure.

5.5.2.1 CCA Board Removal and Disassembly

CAUTION

When removing, replacing or making contact with printed circuit boards, be sure to work on an anti-static surface and use a grounded wrist strap.

MOTOR CONTROLLER BOARD REMOVAL

1. Disconnect the channel A and B strain beam, motion sensor, AIL/door and motor drive connectors from the jacks on the motor controller board.
2. Use a #2 Phillips screwdriver to remove the 4 screws attaching the front case CCA boards to the case assembly.
3. Carefully separate the motor controller board from the logic board by disconnecting the plug on the motor control board from J3 on the logic board.

LOGIC BOARD REMOVAL

1. Carefully separate the logic board from the front display board by disconnecting J2 on the logic board from the plug on the display board.

DISPLAY BOARD REMOVAL

1. Disconnect the LCD ribbon cable from J3 on the display board.
2. Disconnect the keypad ribbon cable from the plug on the back of the display board.

LCD DISPLAY REMOVAL

1. Use a #2 Phillips screwdriver to remove the three screws attaching the LCD to the front case.

2. Lift LCD Display from the front case.

KEYPAD ASSEMBLY REMOVAL

1. Peel the keypad assembly from the front case and thread the ribbon cable from the slot in the front case assembly.

5.5.2.2 Pumping Mechanism Assembly Removal (Figure 6-2/S2)

1. Place the front case assembly face down on the work surface. (Ensure work area is clear of foreign objects that could damage the front panel).
2. Ensure the motion sensor and motor control wire harnesses are disconnected from the motor control board connectors.
3. Cut the wire wraps that bundle the motor control, door sensor and AIL harnesses.
4. Use a #2 Phillips screwdriver to remove the four screws and washers that attach the pumping mechanism assembly to the front case.
5. Lift the pumping mechanism out of the front case.
6. Repeat steps 2 and 5 to remove the other pumping mechanism.

NOTE

When reinstalling the pumping mechanism, place the pumping mechanism in position and start the four mounting screws. Then push the pumping mechanism assembly to the left (looking inboard) against the mounting screws and tighten the screws.

5.5.2.3 Door Sensor Assembly Removal (Figure 6-2/S2)

1. Use a #1 Phillips screwdriver to remove the screw and washer that attach the door sensor harness to the front case.

5.5.2.4 AIL/SCD Assembly Removal and Disassembly (Figure 6-2/S2)

NOTE

Removal of the pumping mechanism (see paragraph 5.5.2.2) is required to provide access to the AIL/SCD Assembly mounting screws.

1. Use a #1 Phillips screwdriver to remove the four screws and washers that attach the AIL/SCD assembly to the front case.
2. Tilt the front case assembly to the upright position and open the door latch. This will prohibit the sear from engaging the ramp type projections on the slide clamp housing.
3. Remove the AIL/SCD assembly from the front case.

5.5.2.5 Transducer Assembly Removal (Figure 6-2/S2)

NOTE

Removal of the pumping mechanism (see paragraph 5.5.2.2) is required to provide access to the Transducer Assembly mounting screws.

The transducer is not supported below the assembly level. **DO NOT ATTEMPT TO REPAIR AND REINSTALL.**

1. Use a #1 Phillips screwdriver to remove the four screws and washers that attach the transducer assembly to the front case.
2. Lift the transducer assembly out of the front case.

NOTE

Refer to torque table for reassembly of transducer screws for pumping mechanism and transducer assembly.

5.5.2.6 Anchor Bracket Assembly Removal (Figure 6-2/S2)

1. Use pliers to grasp the washer, then press down and compress the spring, and remove the hairpin cotter. Carefully release the downward pressure on the spring allowing it to expand to full length, then remove the washer and spring from the anchor bracket.

NOTE

Spring can fly out at you if you are not careful.

2. Tilt the front case to the upright position, open the door latch, swing the door open and remove the anchor bracket.

5.5.2.7 Access Door Assembly Removal and Disassembly (Figures 6-2/S1 and 6-3)

1. Unlatch and open the door.
2. Use a 1/32 inch or 1 mm drift punch to depress the tip of the upper hinge pin below the lower surface of the front case hinge pivot projection, then ease the upper edge of the door away from the front case while using a finger to trap the hinge pin in its recess. Once the hinge pin is clear, lift the door out of the lower hinge pivot projection.

NOTE

The dowel pin that attaches the cam lock to the door is retained by a spring washer. When removed, the spring washer must be replaced.

3. Use a 1/8 inch or 4 mm drift punch to knock out the dowel pin that attaches the cam lock assembly (door latch) to the door.
4. Use a 1/8 inch (4 mm) drift punch to knock out the spring pin that attaches the sear to the cam lock.
5. Use a 1/16 inch (2 mm) drift punch to knock out the spring pin that attaches the cam lock pawl to the door.

5.5.2.8 Pump Seal Removal (Figure 6-2/S1)

NOTE

To remove the pump seal bezel, it is necessary to first remove the pumping mechanism (see paragraph 5.5.2.2) to provide access to the bezel grounding connection.

1. Use a #1 Phillips screwdriver to remove the 10 screws from the bezel.
2. Use a straight slot screwdriver to pry the top edge of the bezel out of the front case recess.
3. Pull the urethane pump seal from the front case.

NOTES

Prior to installing a replacement pump seal, coat the inside of the seal with 100 µl of Silicone oil (P/N 1025-100).

When reinstalling the pump seal assembly, torque the bezel mounting screws to 3 lb-in.

5.5.2.9 Snap Bracket Removal (Figure 6-2/S1)

1. Use a #1 Phillips screwdriver to remove the screw that attaches the snap bracket to the front case.

5.5.3 Rear Case Disassembly (Figure 6-4)

The following disassembly procedures are sequenced for complete disassembly of the rear case. All subassemblies installed on the interior rear case are directly accessible and can be independently removed and replaced.

5.5.3.1 Battery Removal (Figure 6-4/S1)

1. Use a #2 Phillips screwdriver to remove the screw that secures the battery retention strap to the rear case.
2. Disconnect the fast-ons from the battery terminals.
3. Lift the battery from the battery bracket.

5.5.3.2 Battery Retention Bracket Removal (Figure 6-4/S1)

1. Use a #2 Phillips screwdriver to remove the three remaining screws that attach the battery retention bracket to the rear case.

5.5.3.3 Audio Harness Assembly Removal (Figure 6-4/S1)

NOTE

The battery and battery retention bracket must be removed to allow access to the audio harness connector on the Channel A Communications board.

1. Unplug the audio harness from the connector on the Channel A Communication harness board.
2. Use a #1 Phillips screwdriver to remove the two screws and washers that attach the audio oscillator to the rear case.
3. Lift the audio harness assembly out of the rear case.

5.5.3.4 Transformer Harness Assembly Removal (Figure 6-4/S1)

1. Unplug the transformer harness from J3 on the power supply board, cut the shrink wrap and unsolder the transformer wire from terminal N on the power input module and the wire from terminal G.
2. Use a #2 Phillips screwdriver to remove the four screws that attach the transformer harness assembly to the rear case.
3. Lift the transformer harness assembly from the rear case.

5.5.3.5 AC Power Input Module Assembly Removal (Figure 6-4/S2)

1. Use a #2 Phillips screwdriver to remove the ground wire from the threaded boss on the rear case.
2. Depress the latching fingers on one side of the module and remove it from the exterior side of the rear case.

5.5.3.6 Power Supply Board Removal (Figure 6-4/S1)

NOTE

The battery, and battery retention bracket must be removed to allow access to the screws attaching the power supply board to the rear case.

1. Unplug the audio harness from J2 on the power supply board.
2. Use a #2 Phillips screwdriver to remove the 6 screws that attach the power supply board to the rear case.
3. Lift the power supply board from the rear case.

5.5.3.7 Audio Control Removal (Figure 6-4)

1. Remove the 3/8" dress nut from the exterior of the case.
2. Unplug the audio harness from the Channel A Communications board.
3. Remove the audio control from the mounting hole in the rear case.

5.5.3.8 Communication Harness and Circuit Card Assembly Removal (Figure 6-4/S1)

The communications harness and circuit card assemblies can only be removed intact.

1. Use a #2 Phillips screwdriver to disconnect the channel A and B communication circuit card ground wires from the right and left rear case grounding terminals.
2. Use a 5/16 inch nut driver to remove the two self threading nuts that attach the channel A circuit card to the rear case.
3. Carefully extract the channel A circuit card assembly from its installed position on the rear case.
4. Use a 5/16 inch nut driver to remove the two self threading nuts that attach the channel B circuit card to the rear case.
5. Remove the channel B communications circuit card from its installed position on the rear case.

5.5.3.9 Pole Clamp Assembly Removal and Disassembly (Figure 6-5)

NOTE

The battery, battery retention bracket and power supply board must be removed to allow access to the four pole clamp assembly mounting screws.

1. Use a 5/32 inch Allen driver or wrench to remove the four screws that attach the pole clamp assembly to the rear case. The upper housing and lead screw assembly separate from the rear case.
2. Unscrew the lead screw from the wedge.
3. Remove the label from the end of the knob.
4. Use a #6 straight blade screwdriver to remove the screw that attaches the knob to the lead screw.
5. Pull the knob off of the lead screw shaft.

5.5.3.10 Equipotential Ground Stud Removal

1. Use a 3/8" open end or box wrench to immobilize the grounding stud.
2. Use a 3/8" nut driver to loosen and remove the nut that attaches the grounding stud to the rear case.
3. Remove the grounding stud.

5.6 REASSEMBLY

The procedures for reassembly of the PC-2TX are the reverse of the preceding disassembly procedures. In those cases where a procedure(s) unique to reassembly is required, a note is provided following the last step in the disassembly procedure.

WARNING

Prior to reattaching the AC power cord to the instrument, ensure the male base of the power input module is clean of any electrolyte and thoroughly dry. Check the female contacts on the power cord connector for presence of any electrolyte; clean as required and thoroughly dry.

When removal of washers is specified during disassembly, ensure that all washers are reinstalled during reassembly.

Ensure that all ground wire connections are complete before re-mating the front and rear case.

During reassembly, tighten all screws in accordance with the torque values set forth in Table 5-3.

Table 5-3. Table of Torque Values

| Functional Application | Item Description | Figure/Item Reference | Torque Value |
|-----------------------------------|-----------------------------|-----------------------|---|
| FINAL ASSEMBLY | | | |
| Front Case to Rear Case | #10-32 x 3/8 | 6-4/S1 - 840 | 10.0 ±0.5 in lb |
| Ground wire to Rear Case | #10-24 x 0.38 | 6-4/S1 - 960 | 10.0 ±0.5 in lb |
| Power Cord Strap to Rear Case | #6-32 x 0.37 | 6-4/S2 - 850 | 7.0 ±0.5 in lb |
| Power Cord Bracket to Rear Case | #4-40 x 0.37 | 6-4/S2 - 880 | 3.0 ±0.5 in lb |
| FRONT CASE | | | |
| CCA Board Bracket to Front Case | #6-32 x 1.25 | 6-2/S2 - 930 | 3.0 in lb |
| Pumping Mechanism to Front Case | #6-32 x 0.38 (self locking) | 6-2/S2 - 870 | 7.0 in lb |
| Door Sensor to Front Case | #4-40 x 0.25 | 6-2/S2 - 900 | 3.0 ±0.5 in lb |
| Transducer Assy. to Front Case | #4-40 x 0.31 (Self locking) | 6-2/S2 - 820 | 32.0 ±0.5 in oz ¹ 3.0 ±0.5 in lb ² |
| AIL/Slide Clamp to Front Case | #4-40 x .25 | 6-2/S2 - 890 | 3.0 ±0.5 in lb |
| Pump Seal Bezel to Front Case | #4-40 x 0.37 | 6-2/S1 - 860 | 3.0 ±0.5 in lb |
| Snap Bracket to Front Case | #4-4- x 0.18 | 6-2/S1 - 970 | 3.0 ±0.5 in lb |
| LCD Assy to Front Case | #6-32 x .25 | 6-2/S2 - 920 | 3.0 ±0.5 in lb |
| REAR CASE | | | |
| Audio Oscillator to Rear Case | #4-40 x 0.37 | 6-4/S1 - 945 | 3.0 ±0.5 in lb |
| Transformer Assy to Rear Case | #6-32 x 1.0 | 6-4/S1 - 940 | 7.0 ±0.5 in lb |
| Ground Wire to Rear Case | #10-24 x 0.38 | 6-4/S1 - 960 | 10.0 ±0.5 in lb |
| Power Supply Board to Rear Case | #6-32 x 0.38 | 6-4/S1 - 970 | 3.0 ±0.5 in lb |
| Audio Control Switch to Rear Case | Nut, 3/8-33 | 6-4/S2 - 1010 | 10.0 ±0.5 in lb |
| Pole Clamp Housing to Rear Case | #10-32 x 1 | 6-5 - 100 | 20.0 ±0.5 in lb |
| Pole Clamp Knob to Lead Screw | 5/16-18 x 0.5 | 6-4/S2 - 830 | N/A |

1. Stage 1: Torque each screw to 32 ±0.5 in oz in clockwise pattern.
2. Stage 2: Torque each screw to 3.0 ±0.5 in lb in counterclockwise pattern.

NOTE

Whenever the NyLok screws that attach the pumping mechanism to the front case are removed, new NyLoc screws should be used for the re-installation of the pumping mechanism.

SECTION 6 - ILLUSTRATED PARTS BREAKDOWN

6.1 INTRODUCTION

The tables and figures presented in this section identify the sub-assemblies and list the component parts of each sub-assembly in the IMED® GEMINI PC-2TX® Volumetric Pump/Controller ("PC-2TX"). Any part listed without an accompanying part number is not field replaceable, and is available only as an integral part of the next higher assembly.

NOTE

Use of parts procured from sources other than ALARIS Medical Systems will void the product warranty.

Each tabular listing of parts is supplemented with either an exploded view illustration of the respective assembly or a component location diagram. These drawings are provided solely for use by biomedical technicians and engineers to service, maintain and/or repair the PC-2TX. Customers experiencing repair requirements beyond their local capability are encouraged to return those items or assemblies to ALARIS Medical for repair or replacement. The ALARIS Medical Service Department maintains facilities to troubleshoot, repair and test all PC-2TX integrated circuit boards.

In the event difficulty is encountered in identifying any part, ALARIS Medical Systems Customer Service Department should be contacted by telephone, fax or letter for assistance.

PC-2TX

Table 6-1. Parts List - PC-2TX Pump Assembly

| Fig No/Item | | Qty | Description | Part No | Reference |
|-------------|-----|-----|----------------------------------|------------|-----------|
| 6-1 | | X | PC-2TX Pump Assembly | 25-1023-1 | |
| | | X | PC-2TX Pump Assy w/vented Keypad | 25-1014-2 | |
| 6-1 | 530 | 1 | Label, Factory Seal | 922-2027-7 | |
| 6-1 | 580 | 1 | Label, S/N Replacement | 125569 | |
| 6-1 | 600 | 1 | Label, Operator's Instruction | 20-2394-7 | |

Table 6-1a. Parts List - PC-2TX Pump Assembly **220V**

(Special 220V & CE Parts & Labels)

| Fig No/Item | Qty | Description | Part No | Reference |
|-------------|-----|---|-----------|-----------|
| | X | PC-2TX Pump Assembly (CE) England | 25-1025-1 | |
| | X | PC-2TX Pump Assembly (CE) Australia | 25-1025-2 | |
| 210 | 1 | Power Entry Module International w/o switch | 20-1333-1 | |
| 330 | 1 | Transformer Assembly, 220V, 50HZ | 142001 | |
| 410 | 1 | CCA, Harness/PWB, I/O | 142325 | |
| 455 | 1 | CCA, Logic, PC-2TX | 143182 | |
| 460 | 1 | CCA, Display, PC-2TX | 142340 | |
| 480 | 1 | CCA, Controller, PC-2TX | 142336 | |
| 590 | 1 | Label Kit, REAR, 220V Eng | 25-1019-1 | |
| 770 | 1 | Power Cord, 5 AMP, U.K. | 848009 | |
| | 1 | Power Cord, (Continental Europe) | 848008 | |
| | 1 | Power Cord, (Australia) | 848012 | |
| 915 | 1 | Fuse 5X20MM .1A 250V Slow-Blow | 842020 | |
| 990 | 1 | Nut, M-6, Hex, Brs, Nkl Pld | 802012 | |
| 1025 | 1 | Washer, Shprf, 6.4MM | 803217 | |
| 1070 | 1 | Washer, Flat, 6.4MM | 803032 | |
| 1330 | 1 | Stud Earth Pot Equalization | 809097 | |

PC-2TX

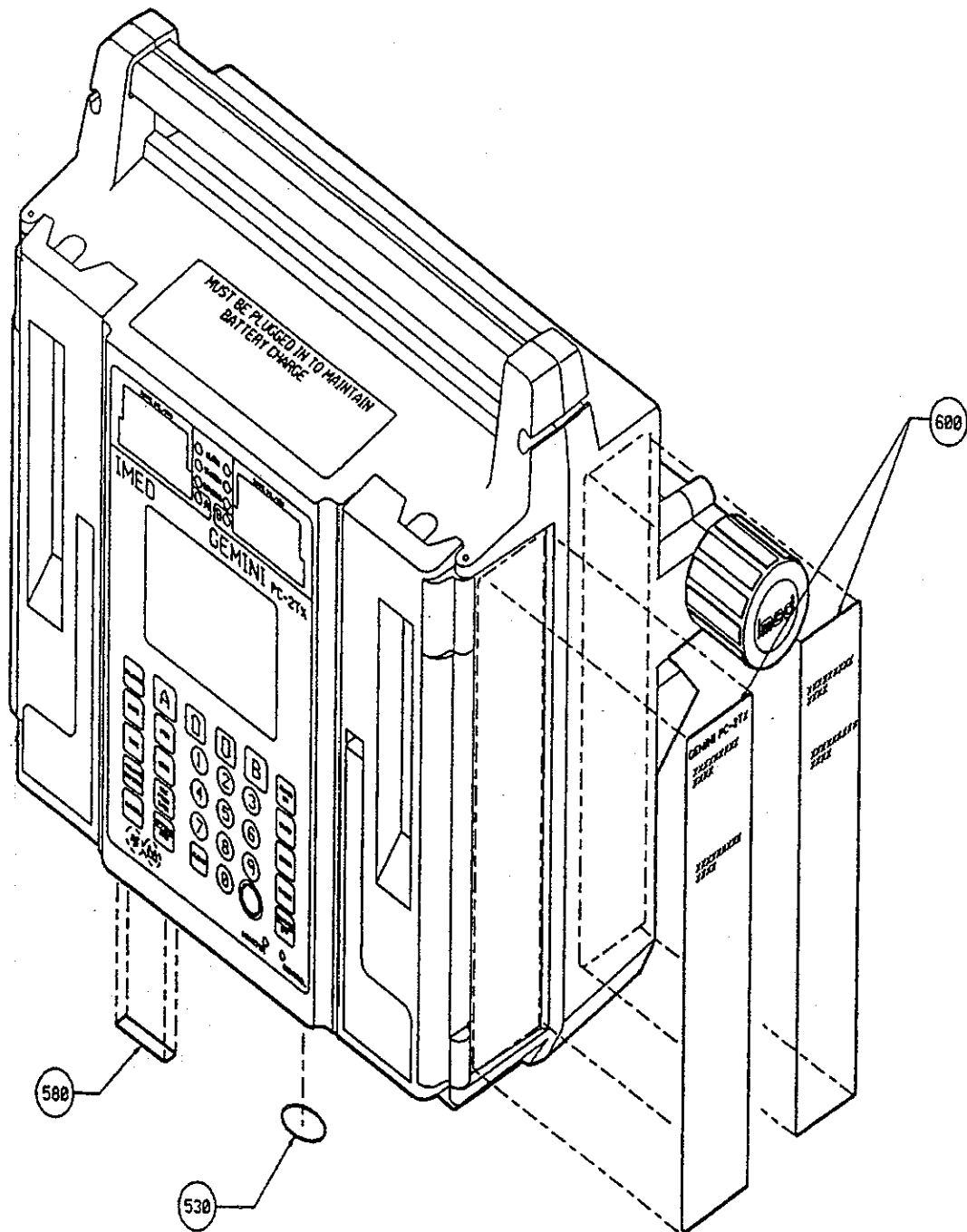


Figure 6-1. Parts Identification
PC-2TX Pump Assembly

Table 6-2. Parts List - Front Case Assembly

| Fig/Sht No Item | Qty | Description | Part No | Reference |
|-----------------|-----|---|------------|---------------|
| 6-2/S1 10 | | Front Case, PC-2TX, Molded | 20-2383-7 | |
| 6-2/S1 30 | 1 | Door Assembly, Left, Outer | 20-1328-1 | |
| 6-2/S1 40 | 1 | Door Assembly, Right, Outer | 20-1328-2 | |
| 6-2/S1 50 | 4 | Hinge Pin Gemini | 20-2105-7 | |
| 6-2/S2 60 | 2 | Harness Assembly, Door, PC-4 | 40-1110-1 | |
| 6-2/S2 70 | 2 | Mounting Bracket Hall Sensor | 20-2426-7 | |
| 6-2/S1 90 | 2 | Anchor Bracket, TPRD, Zn-Ni Plated | 20-2198-10 | |
| 6-2/S1 100 | 2 | Roller, Anchor Bracket | 20-2150-7 | |
| 6-2/S1 110 | 2 | Bracket, Lower Fitment | 40-2069-7 | |
| 6-2/S1 120 | 2 | Seal, Pump Urethane | 20-2284-7 | |
| 6-2/S1 130 | 2 | Bezel, Seal Retaining | 20-2121-7 | |
| 6-2/S2 140 | 2 | Pumping Mechanism Assy., Fractional | 10-1132-4 | |
| 6-2/S2 150 | 1 | Guard | 10-3041-7 | |
| 6-2/S2 170 | 2 | Housing Assembly, Air-in-line | 20-1314-1 | |
| 6-2/S2 180 | 2 | Gasket, Air-in-line | 10-2094-7 | |
| 6-2/S2 190 | 2 | Transducer, Assembly, w/uv Coating | 20-1194-2 | |
| 6-2/S2 200 | 8 | Spacer, Stainless Steel #4 | 20-3043-7 | |
| 6-2/S1 280 | 1 | Handle, Gemini | 20-2133-7 | |
| 6-2/S1 290 | 1 | Insert, Handle Pad | 20-2149-7 | |
| 6-2/S2 370 | 1 | Bracket Display | 20-2376-7 | |
| 6-2/S2 380 | 2 | Alarm Circuit Assy., Mech. Upper (MAC II) | 10-3045-1 | |
| 6-2/S2 390 | 2 | Alarm Circuit Assy., Mech. Lower (MAC II) | 10-3046-1 | |
| 6-2/S2 395 | 2 | Plate Assy Top | 10-1164-1 | |
| 6-2/S1 400 | 1 | Keypad Assembly, PC-2TX Vented | 20-3001-1 | |
| 6-2/S2 440 | 1 | LCD Assembly, PC-2TX | 20-1277-1 | |
| 6-2/S2 450 | 1 | CCA, Logic Board Assy. | 143181 | See Table 6-8 |
| 455 | 1 | CCA, Logic Board Assy. | 143181 | See Table 6-8 |
| 6-2/S2 460 | 1 | CCA, PC-2TX Display | 142328 | See Table 6-7 |
| 470 | 1 | PWB Shield, Power Supply, PC-2TX | 20-6064-7 | |
| 6-2/S2 480 | 1 | CCA, PC-2TX Controller | 142330 | See Table 6-9 |
| 481 | 1 | CCA, PC-2TX Controller (220V) | 142336 | Alt item 480 |
| 6-2/S2 510 | 2 | Keypad, Ground Cable | 20-1338-1 | |
| 6-2/S1 540 | 2 | Label, Air-in-line | 20-2369-7 | |
| 6-2/S1 560 | 1 | Label, Generic Warning, PC-2TX/PC-4 | 25-2005-7 | |
| 6-2/S1 590 | 2 | Label, Warning, Roller Clamp | 20-2407-7 | |
| 6-2/S1 690 | 4 | Bumper, Rubber | 303724 | |
| 6-2/S2 710 | 2 | Spring, Door 2.5 lb/in SST | 809039 | |
| 6-1/S2 720 | 2 | Spring Compression 13.2 lb/in | 809088 | |
| 6-1/S2 740 | 2 | Pin, Dowel, 3/32 x .5, SST | 804001 | |
| 6-2/S2 750 | 2 | Pin, Cotter, 1/4 x 1.0 Spring w/Zinc | 804201 | |
| 6-2/S2 820 | 8 | Screw, Machine 4-40 x .31, PNH, SLFLKG | 801063 | |

Table 6-2. Parts List - Front Case Assembly (Cont'd)

| Fig/Sht No Item | Qty | Description | Part No | Reference |
|-----------------|-----|---|-----------|-----------------|
| 6-2/S2 840 | 4 | Screw, Cap, 10-32 x .37, Hex STDHD | 801326 | |
| 6-2/S1 860 | 20 | Screw, SLFTPG, 4-40 x .43, F, XREC, 82 | 801409 | |
| 6-2/S2 870 | 8 | Screw, Machine, 6-32 x .38, PNH, SLFLKG | 801062 | |
| 6-2/S2 890 | 8 | Screw, Machine, 4-40 x .25, XREC, PNH | 801002 | |
| 6-2/S2 900 | 2 | Screw, Machine, 4-40 x .31, XREC, PNH | 801038 | |
| 6-2/S2 910 | 1 | Screw, Machine, 4-40 x .12, XREC, PNH | 801053 | |
| 6-2/S2 920 | 1 | Screw, Machine, 6-32 x .37, XREC, PNH | 801006 | |
| 6-2/S2 925 | 2 | Screw, Machine, 6-32 x .25, XREC, PNH | 801000 | Alt item 920 |
| 6-2/S2 930 | 4 | Screw, Machine, 6-32 x 1.25, XREC, PNH | 801143 | |
| 6-2/S1 970 | 10 | Screw, Machine, 4-40 x .18, XREC,PNH | 801042 | |
| 6-2/S1 1020 | 0 | Washer, Flat, 10 Nylon | 803026 | w/items 31 & 41 |
| 6-2/S2 1030 | 4 | Washer, 1/4" I.D. 1/2" O.D. SS | 803619 | |
| 6-2/S2 1040 | 10 | Washer, Flat, 4, Carbon Steel, Galv. | 803000 | |
| 6-2/S2 1050 | 12 | Washer, Flat, 6, Carbon Steel, Galv. | 803002 | |
| 6-2/S2 1250 | AR | Seal, Cord .103 Conductive | 834042PK2 | |
| 6-2/S2 1270 | 2 | Cable CL NYL W/ADH MT 1/8DX | 845023 | |
| 6-2/S2 1275 | 2 | Cable CL NYL W/ADH MT 1/4DX | 845024 | |
| 6-2/S2 1290 | | Cable, Tie 4: Auto Feed | 834031 | |
| 6-2/S2 1310 | | Tie CD PVC .020-.080 Dia | 834000 | |

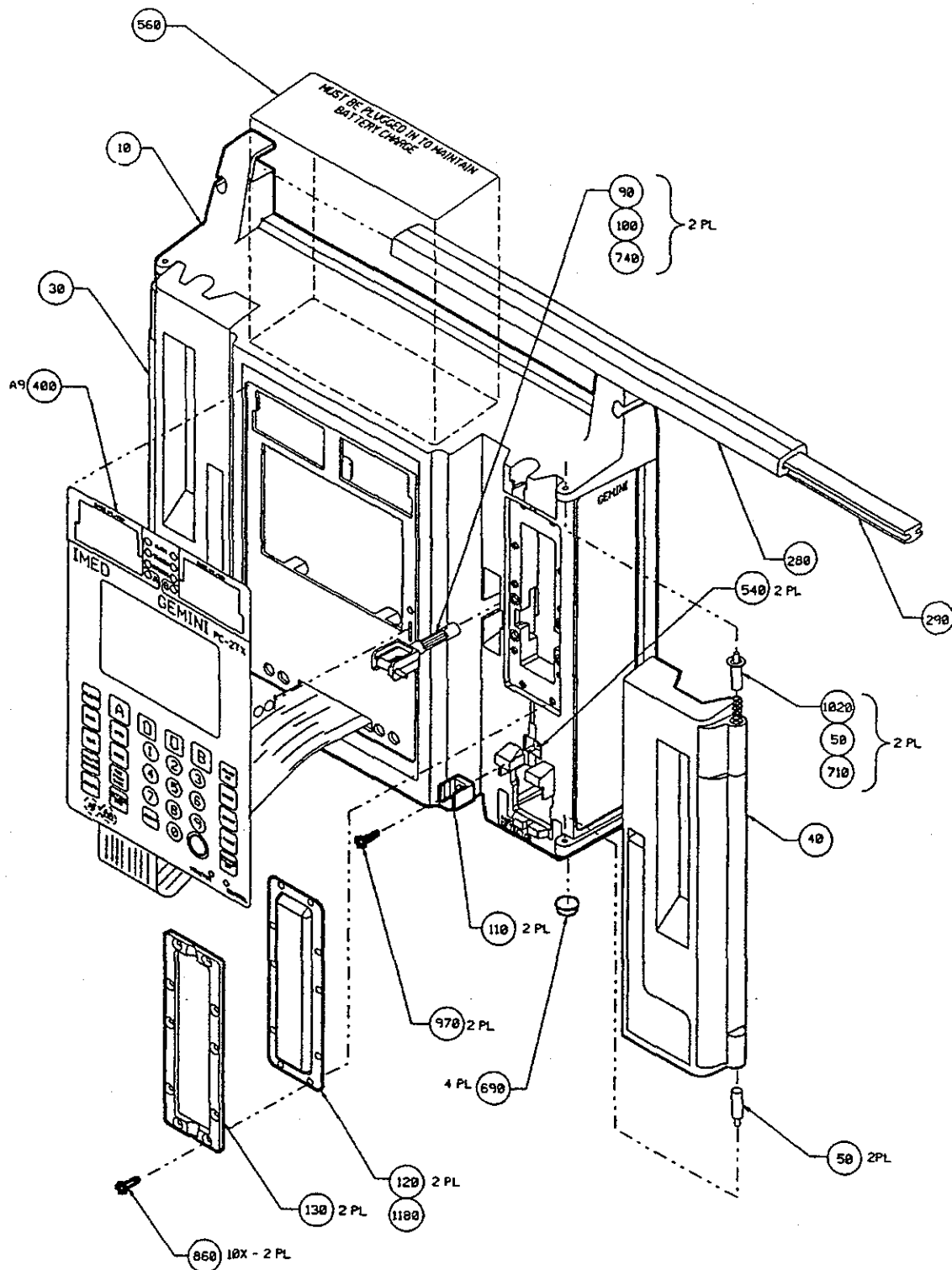


Figure 6-2. Parts Identification
Front Case Assembly (Sheet 1)

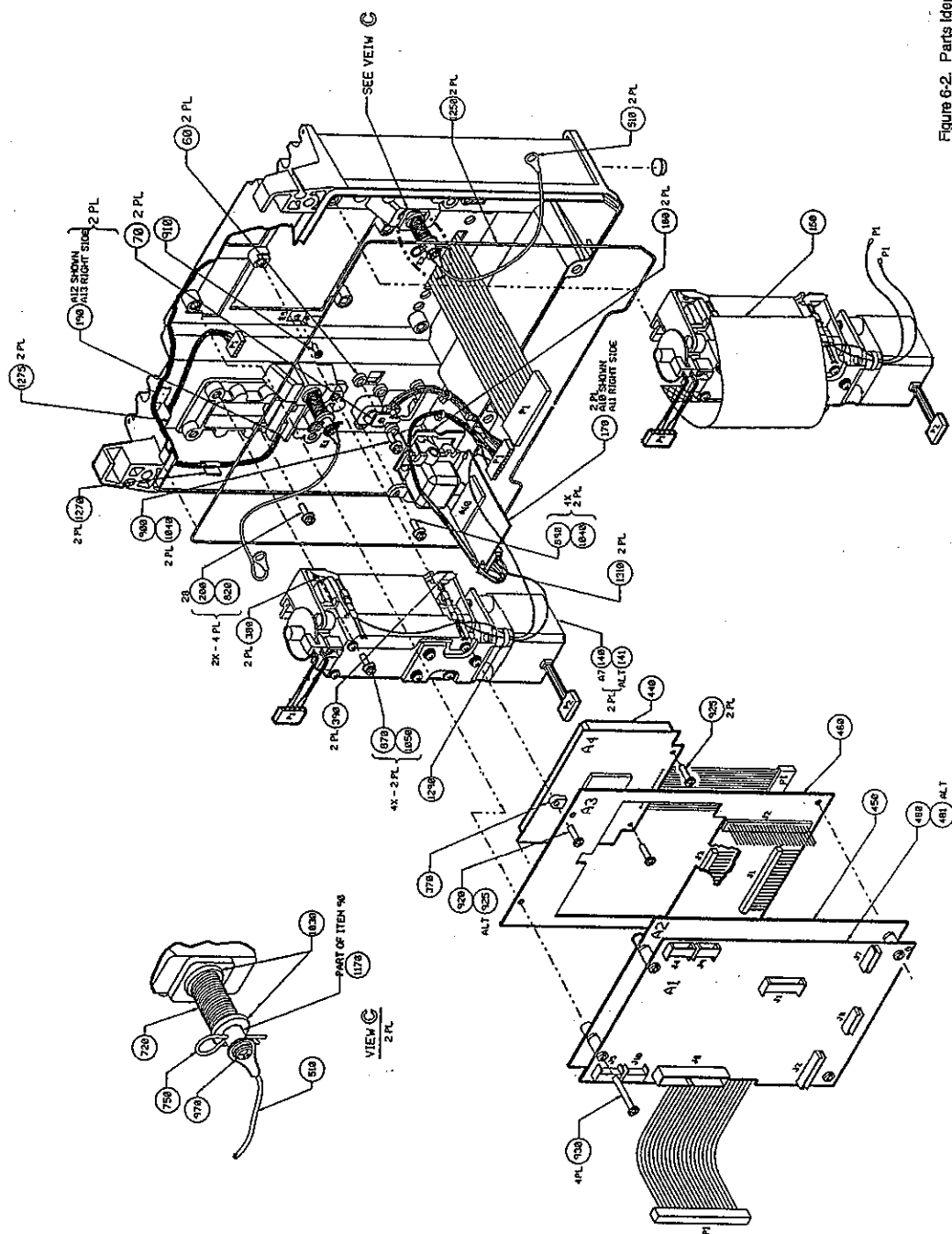


Figure 6-2. Parts Identification Front Case Assembly (Sheet 2)

Table 6-3. Parts List - Door Assembly

| Fig No/Item | Qty | Description | Part No | Reference |
|-------------|-----|------------------------------------|------------|-----------|
| 6-2/S1 30 | X | Door Assembly, Right | 20-1328-2 | Table 6-2 |
| 6-2/S1 40 | X | Door Assembly, Left | 20-1328-1 | Table 6-2 |
| 6-3 1 | 1 | Door, Left, Gemini, Annealed | 20-2425-13 | |
| Not Shown | 1 | Door, Right, Gemini, Annealed | 20-2425-14 | |
| 6-3 | 1 | Cam Lock Assembly - Left | 40-1039-1 | |
| Not Shown | 1 | Cam Lock Assembly - Right | 40-1039-2 | |
| 6-3 2 | 1 | Cam Lock - Left | 20-2165-7 | |
| Not Shown | 1 | Cam Lock - Right | 20-2165-8 | |
| 6-3 3 | 2 | Pin, Dowel 5/32 x 0.87 SST | 804003 | |
| 6-3 3a | 2 | Ring, Retaining 5/32 SST | 806214 | |
| 6-3 4 | 2 | Magnet | 809015 | |
| 6-3 5 | 2 | Sear, Machined, Extended | 20-2279-8 | |
| 6-3 6 | 2 | Pin, Spring 5/32 x 0.75 Light Duty | 804004 | |
| 6-3 7 | 2 | Spring, Torsion 0.5 in-lb | 809071 | |
| 6-3 8 | 2 | Screw, Set #2-56 x 0.18, HEX, OVAL | 801421 | |
| 6-3 9 | 2 | Pawl, Cam Lock, Flat Nosed | 20-2385-7 | |
| 6-3 10 | 2 | Spring, Cam Lock Latch | 20-2154-7 | |
| 6-3 11 | 2 | Pin, Dowel 3/32 x 1/2 LG SST | 804105 | |

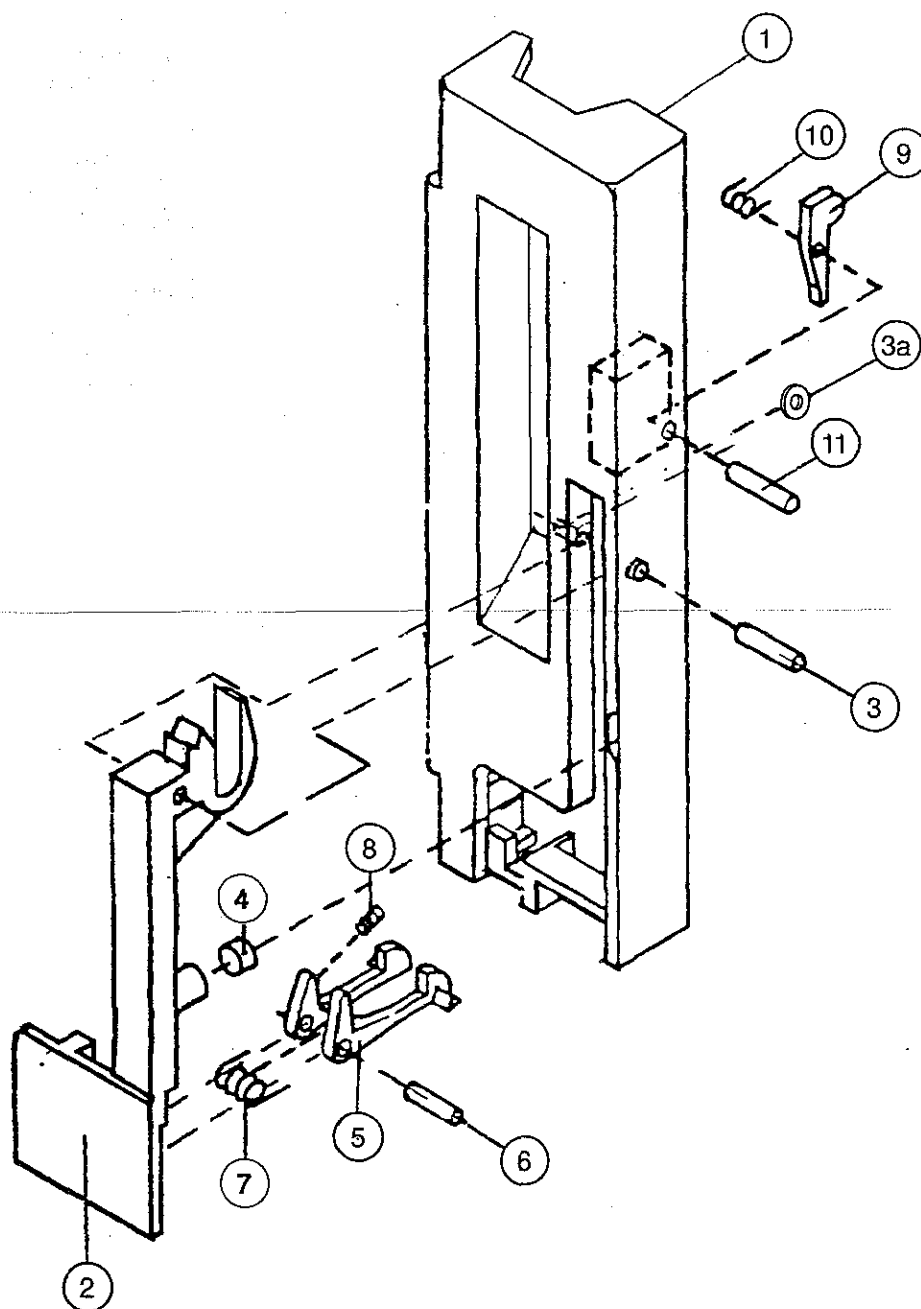


Figure 6-3. Parts Identification - Door Assembly

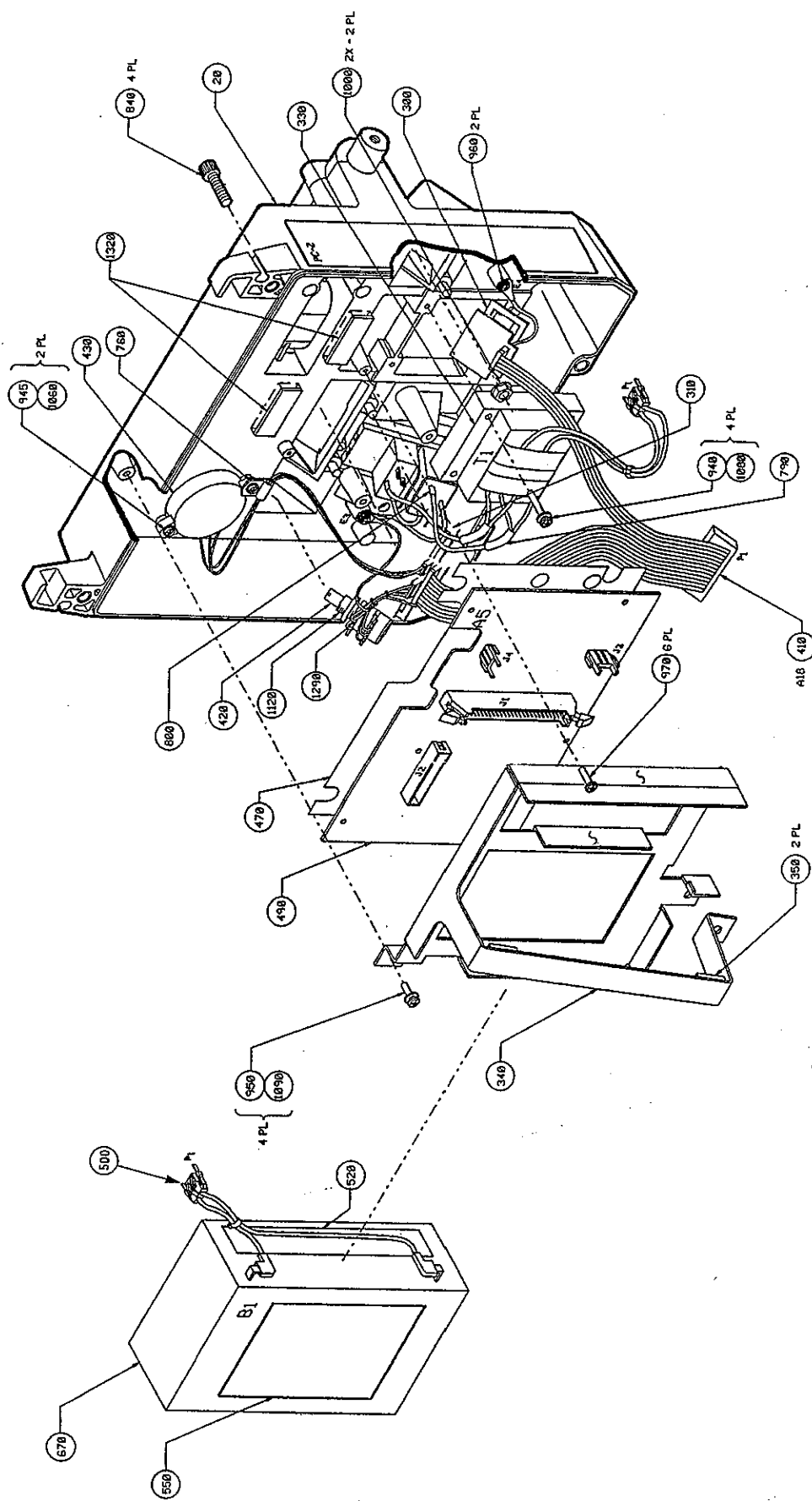
Table 6-4. Parts List - Rear Case Assembly

| Fig/Sht No Item | Qty | Description | Part No | Reference |
|-----------------|-----|--|------------|----------------|
| 6-4 20 | 1 | Pole Clamp Assembly, PC-2TX | 25-1012-1 | see Table 6-5 |
| 6-4/S2 210 | 1 | AC Receptacle Assy, Domestic 0.4A fuse | 20-1079-1 | |
| 6-4/S2 220 | 1 | Gasket, Seal A/C Receptacle | 10-2102-7 | |
| 6-4/S2 230 | 2 | Spring, A/C Locking | 10-2004-7 | |
| 6-4/S2 250 | 1 | Power Cord, Universal | 142758 | |
| 6-4/S2 260 | 1 | Hood, A/C Receptacle, Domestic | 10-2037-7 | |
| 6-4/S2 270 | 1 | Power Cord Wrap Assembly | 980-1015-1 | |
| 6-4/S1 300 | 1 | Gasket, Comm Board Channel A | 20-2331-7 | |
| 6-4/S1 310 | 1 | Gasket, Comm Board Channel B | 20-2332-7 | |
| 6-4/S1 330 | 1 | Transformer Assembly, PC-2TX | 25-1026-1 | |
| 6-4/S1 340 | 1 | Bracket, Battery, PC-2TX | 25-2002-7 | |
| 6-4/S1 350 | 2 | Foot, Battery | 40-2050-7 | |
| 6-4/S2 360 | 1 | Knob Round Shaft Pole Clamp | 10-2150-1 | |
| 6-4/S1 410 | 1 | Harness Assembly, ECD Communication | 142323 | |
| 6-4/S1 420 | 1 | Harness Assembly, PC-1T Audio/Switch | 10-1180-1 | |
| 6-4/S1 430 | 1 | Harness, Audio PC-2 | 20-1331-1 | |
| 6-4/S1 470 | 1 | PWB, Shield, Power Supply, PC-2TX | 20-6064-7 | |
| 6-4/S1 490 | 1 | CCA, PC-2TX Power Supply | 142329 | |
| 6-4/S1 500 | 1 | Harness Assembly, Battery, PC-2TX | 25-1027-1 | |
| 6-4/S1 520 | 1 | Label, Battery Specification | 20-2424-7 | |
| 6-4/S1 550 | 1 | Label, Battery History | 10-2101-7 | |
| 6-4/S2 570 | 1 | Label, Pole Clamp | 143896 | |
| 6-4/S2 590 | 1 | Label Kit, Rear, 110V Eng/French | 142211 | part of 142211 |
| 6-4/S2 620 | 1 | Label, Grounding Instruction | 20-2391-7 | |
| 6-4/S1 670 | 1 | Battery, 12AH, PANASONIC | 841026 | |
| 6-4/S1 700 | 1 | Stud Brass Snap | 809061 | |
| 6-4/S1 760 | 1 | Cable, CI Key Slot 1/8 x 21/64 | 845005 | |
| 6-4/S1 790 | 1 | Tubing Heat Shrink 1/8" Blk Genrl Prp | 834003 | |
| 6-4/S2 830 | 1 | Screw, Machine, 5/16-18 x .50, SLTD, PNH | 801019 | |
| 6-4/S2 850 | 1 | Screw, Machine, 6-32 x .37, XREC .82FLH | 801116 | |
| 6-4/S2 880 | 3 | Screw, Machine, 4-40 x .37, XREC, PNH | 801003 | |
| 6-4/S1 940 | 4 | Screw, Machine, 6-32 x 1.0, XREC, PNH | 801037 | |
| 6-4/S1 945 | 2 | Screw, Machine, 4-4- x .50, XREC, PNH | 801004 | |
| 6-4/S1 950 | 4 | Screw, Machine, 10-32 x .37, XREC, PNH | 801009 | |
| 6-4/S1 960 | 2 | Screw, Machine, 10-32 x .25, XREC, PNH | 801032 | |
| 6-4/S1 970 | 8 | Screw, Machine, 4-40 x .18, XREC, PNH | 801042 | |
| 6-4/S1 1000 | 4 | Nut, 3/16, SLFTHD | 802612 | |
| 6-4/S2 1010 | 1 | Nut, 3/8-32, Dress | 802007 | |
| 6-4/S1 1060 | 2 | Washer, 6, SST | 803021 | |
| 6-4/S1 1080 | 4 | Lock Washer, INTL, A/B, 6, C STL, GALV | 803201 | |
| 6-4/S1 1090 | 4 | Lock Washer, SPR SPT, 10, STL | 803215 | |
| 6-4/S2 1110 | 1 | Lock Washer, 5/16, Carbon STL, GALV | 803210 | |
| 6-4/S1 1120 | 1 | Lock Washer, INTL, A/B, 3/8, CS, GALV | 803216 | |
| 6-4/S1 1290 | | Cable Tie 4" Auto Feed | 834031 | |

PC-2TX

Table 6-5. Parts List - Pole Clamp Assembly

| Fig No/Item | Qty | Description | Part No | Reference |
|-------------|-----|---|------------|-------------------|
| 6-5 | x | Pole Clamp Assembly, Acme, PC-2TX | 25-1012-1 | |
| 6-5 | 10 | 1 Leadscrew, Pole Clamp, Acme Thr, PC-1/2 | 40-2068-7 | |
| 6-5 | 20 | 1 Housing, Upper Pole Clamp, Lt Blue | 20-2003-10 | |
| 6-5 | 30 | 1 Friction Strip, Pole Clamp | 20-2009-7 | |
| 6-5 | 40 | 2 Thrust Washer, Pole Clamp | 10-3003-7 | |
| 6-5 | 50 | 1 Wedge, Pole Clamp | 20-2423-9 | |
| 6-5 | 60 | 1 Case, Rear, PC-2TX, Powder Coated | 20-2377-9 | part of 25-1012-1 |
| 6-5 | 70 | 1 Foam Insert, Pole Clamp | 20-3056-7 | |
| 6-5 | 100 | 4 Screw, Cap, 10-32 x 1, Hex, STL | 801321 | |
| 6-5 | 110 | AR Locktite,242,REM,Threadlocking | 832008 | |
| 6-5 | 120 | AR Lube MLYGRES BR2 | 831003 | |



**Figure 6-4. Parts Identification
Rear Case Assembly (Sheet 1)**

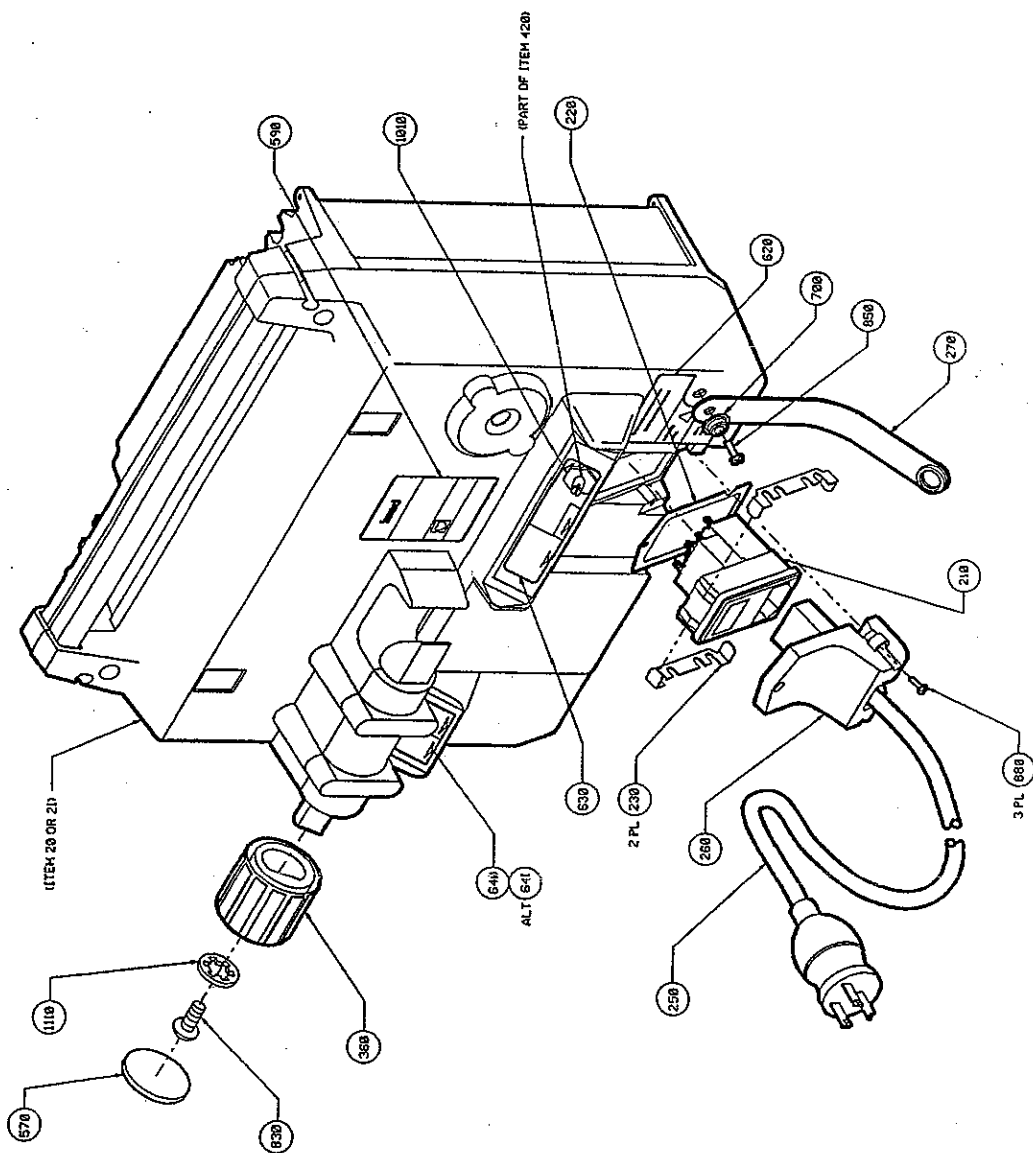


Figure 6-4. Parts Identification
Rear Case Assembly (Sheet 2)

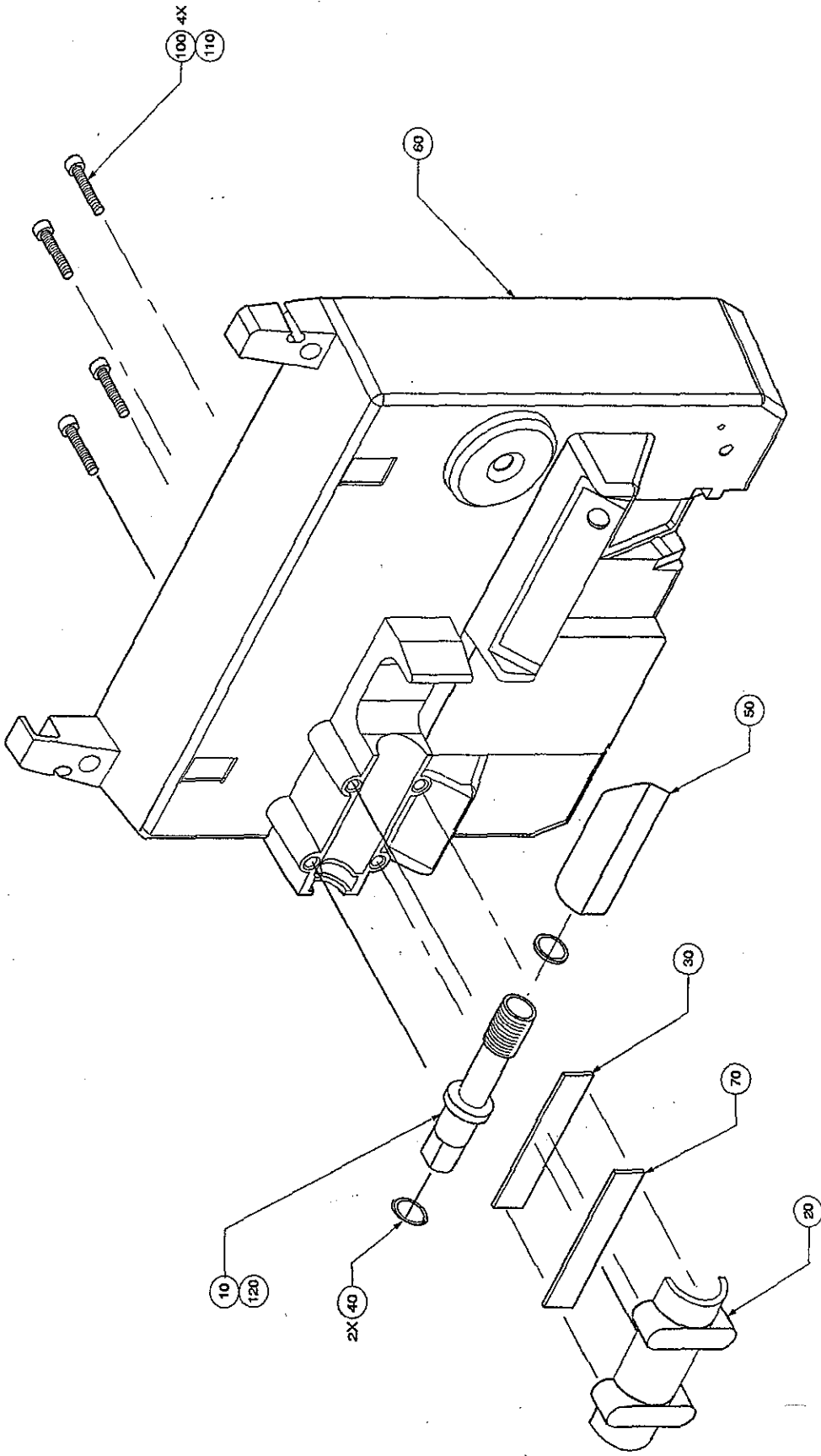


Figure 6-5 Parts Identification
Pole Clamp Assembly

Table 6-6. Parts List - Power Supply Board CCA

| Fig No | Ref Desig. | Qty | Description | Part Number | Reference |
|----------------------------|------------|-----|--------------------------------|-------------|------------|
| 6-2 | 10 | X | CCA, PC-2TX POWER SUPPLY | 142329 | Fig 6-4/S1 |
| Integrated Circuits | | | | | |
| 6-6 | U1 | 1 | IC TL431 PROGRAMMABLE PRN | 812190 | |
| 6-6 | U2 | 1 | IC LM385-2.5,1.5% VOLTAGE REF | 812234 | |
| 6-6 | U3 | 1 | INVERTER, BK-LITE,5VIN,100VOUT | 815074 | |
| 6-6 | U4 | 1 | IC,LM3578 SWITCHING REGULATOR | 812191 | |
| 6-6 | U5 | 2 | IC CMOS RS-232/CCITT V.28 | 812146 | |
| 6-6 | U6 | 1 | IC,2954,5V REGULATOR | 812266 | |
| 6-6 | U7 | 1 | IC,2951,5V,REG W/SHUTDOWN | 812261 | |
| 6-6 | U8 | 1 | IC,TLC27M2A,VIO,5MV,OP-AMP | 812219 | |
| 6-6 | U9,U10 | 2 | IC,TL431 PROGRAMMABLE PRN | 812190 | |
| 6-6 | U11 | 1 | IC,TLC393,DUAL VOLT COMPARATOR | 812218 | |
| 6-6 | U12 | 1 | IC,TLC27M2A,VIO,5MV,OP-AMP | 812219 | |
| 6-6 | U13 | 1 | IC,2524A REGULATING PULSE WD | 812168 | |
| 6-6 | U22 | 1 | IC,LM385-2.5,1.5% VOLTAGE REF | 812234 | |
| Capacitors | | | | | |
| 6-6 | C1 | 1 | CAP,CER,X7R,50V,20%,.001UF,AX | 811247102A | |
| 6-6 | C2 | 1 | CAP,CER,Z5U,50V,20%,.22UF,AX | 811247224A | |
| 6-6 | C3 | 1 | CAP,CER,X7R,50V,10%,.01UF AX | 811246103A | |
| 6-6 | C4 | 1 | CAP,CER,Z5U,50V,20%,0.1UF AX | 811247104A | |
| 6-6 | C5 | 1 | CAP,CER,X7R,50V,20%,.001UF,AX | 811247102A | |
| 6-6 | C6 | 1 | CAP,CER,COG,100V,10%,10PF,AX | 811256100A | |
| 6-6 | C7 | 1 | CAP,CER,X7R,50V,10%,.01UF AX | 811246103A | |
| 6-6 | C8 | 1 | CAP,TANT,20V,10%,1UF,AX | 811136105A | |
| 6-6 | C9,C10 | 2 | CAP,TANT,10V,10%,10UF,AX | 811116106A | |
| 6-6 | C11 | 1 | CAP,AL ELCTLT,63V,20%,1000UF | 811397-108 | |
| 6-6 | C12 | 1 | CAP,TANT,20V,20%,4.7UF,AX | 811137475A | |
| 6-6 | C13 | 1 | CAP,AL ELCTLT,25V,20%,220UF, | 811397-227 | |
| 6-6 | C14 | 1 | CAP,AL ELCTLT,10V,20%,330UF | 811317-337 | |
| 6-6 | C15 | 1 | CAP,AL ELCTLT,25V,20%,220UF, | 811397-227 | |
| 6-6 | C16 | 1 | CAP,AL ELCTLT,10V,20%,1000PF | 811317-108 | |
| 6-6 | C17 | 1 | CAP,TANT,20V,20%,4.7UF,AX | 811137475A | |
| 6-6 | C18 | 1 | CAP,TANT,10V,10%,10UF,AX | 811116106A | |
| 6-6 | C19 | 1 | CAP,CER,Z5U,50V,20%,0.1UF AX | 811247104A | |
| 6-6 | C20 | 1 | CAP,CER,X7R,50V,10%,.01UF AX | 811246103A | |
| 6-6 | C21 | 1 | CAP,CER,Z5U,50V,20%,.1UF AX | 811247104A | |
| 6-6 | C22 | 1 | CAP,CER,X7R,50V,20%,.001UF,AX | 811247102A | |
| 6-6 | C23 | 1 | CAP,CER,100V,10%,68PF,AX | 811256680A | |
| 6-6 | C24 | 1 | CAP,CER,100V,10%,3300PF,AX | 811256332A | |
| | C25 | | NOT USED | | |
| 6-6 | C26,27 | 2 | CAP,CER,Z5U,50V,20%,.1UF AX | 811247104A | |

Table 6-6. Parts List - Power Supply Board CCA

| Fig No | Ref Desig. | Qty | Description | Part Number | Reference |
|------------------|------------|-----|--------------------------------|-------------|-----------|
| | C28 | | NOT USED | | |
| 6-6 | C29 | 1 | CAP,CER,Z5U,50V,20%,.1UF AX | 811247104A | |
| 6-6 | C30 | 1 | CAP,AL ELCTLT,10V,20%,330UF | 811317-337 | |
| 6-6 | C31 | 1 | CAP,TANT,10V,10%,6.8UF,AX | 811116685A | |
| 6-6 | C32 | 1 | CAP,TANT,20V,10%,1UF,AX | 811136105A | |
| 6-6 | C33 | 1 | CAP,TANT,20V,20%,39UF,AX | 811137396A | |
| 6-6 | C34,C35 | 2 | CAP,TANT,10V,10%,10UF,AX | 811116106A | |
| 6-6 | C36 | 1 | CAP,AL ELCTLT,25V,20%,220UF, | 811397-227 | |
| 6-6 | C37 | 1 | CAP,TANT,20V,20%,3.9UF,AX | 811137395A | |
| 6-6 | C38-C40 | 3 | CAP,CER,X7R,50V,20%,.001UF,AX | 811247102A | |
| 6-6 | C41 | 1 | CAP,CER,Z5U,50V,20%,.1UF AX | 811247104A | |
| 6-6 | C42 | 1 | CAP,CER,COG,100V,10%,10PF,AX | 811256100A | |
| 6-6 | C43 | 1 | CAP,CER,Z5U,50V,20%,.1UF AX | 811247104A | |
| 6-6 | C44 | 1 | CAP,CER,X7R,100V,10%,820PF,AX | 811256821A | |
| 6-6 | C45 | 1 | CAP,CER,COG,100V,10%,10PF,AX | 811256100A | |
| 6-6 | C46 | 1 | CAP,CER,Z5U,50V,20%,.1UF AX | 811247104A | |
| 6-6 | C47,C48 | 2 | CAP,CER,50V,10%,0.022UF,RAD | 811246-223 | |
| Diodes | | | | | |
| 6-6 | D1-D3 | 3 | D10,10A,MBR1060 | 813203 | |
| 6-6 | D4 | 1 | D10 1N5711 SCHOTTKY | 813019 | |
| 6-6 | D5 | 1 | D10,10A,MBR1060 | 813203 | |
| 6-6 | D6 | 1 | D10 1N5711 SCHOTTKY | 813019 | |
| 6-6 | D7 | 1 | D10,10A,MBR1060 | 813203 | |
| 6-6 | D8-D10 | 3 | D10 1N5819 SCHOTTY | 813505 | |
| 6-6 | D11 | 1 | D10 MBR120P SCHOTTKY BARR RECT | 813503 | |
| 6-6 | D12 | 1 | D10 RECT 1N4001 50V | 813200 | |
| 6-6 | D13-D15 | 3 | D10 MBR120P SCHOTTKY BARR RECT | 813503 | |
| 6-6 | D16-D18 | 3 | D10 SILICONE SWITCHING 75V | 813500 | |
| 6-6 | D13-D15 | 3 | D10 MBR120P SCHOTTKY BARR RECT | 813503 | |
| 6-6 | D16-D18 | 3 | D10 SILICONE SWITCHING 75V | 813500 | |
| 6-6 | D19 | 1 | D10,10A,MBR1060 | 813203 | |
| 6-6 | D18 | 1 | D10 SILICONE SWITCHING 75V | 813500 | |
| 6-6 | D19 | 1 | TRANSIENT V SUPPRESSOR 5V | 813024 | |
| 6-6 | D20 | 1 | D10 SILICONE SWITCHING 75V | 813500 | |
| 6-6 | D21,D22 | 2 | D10,ZENER 7.5V 1W | 813023 | |
| Resistors | | | | | |
| 6-6 | R1 | 1 | RES,MET FLM,1/4W,1%,100K | 810229-104 | |
| 6-6 | R2 | 1 | RES,MET FLM,1/4W,1%,8.06K | 8102238061 | |
| 6-6 | R3 | 1 | RES,MET FLM,1/4W,1%,20K | 810229-203 | |
| 6-6 | R4 | 1 | RES,MET FLM,1/4W,1%,43.2K | 8102294322 | |
| 6-6 | R5 | 1 | CFR,1/4W,5%,1K | 810125-102 | |

Table 6-6. Parts List - Power Supply Board CCA

| Fig No | Ref Desig. | Qty | Description | Part Number | Reference |
|--------|------------|-----|------------------------------|-------------|--------------|
| 6-6 | R6 | 1 | RES,MET FLM,1/4W,1%,6.98K | 8102236981 | USE W/142329 |
| 6-6 | R7 | 1 | CFR,1/4W,5%,120 | 810125-121 | |
| 6-6 | R8 | 1 | RES,MET FLM,1/4W,1%,332 | 8102293320 | |
| 6-6 | R9 | 1 | CFR,1/4W,5%,4.7K | 810125-472 | |
| 6-6 | R10 | 1 | CFR,1/4W,5%,100 | 810125-101 | |
| 6-6 | R11 | 1 | RES,WW,0.4W,1%,0.1 | 810591-0R1 | |
| 6-6 | R12 | 1 | RES,MET FLM,1/4W,1%,60.4K | 8102296042 | |
| 6-6 | R13 | 1 | RES,3W,1%,.05,WW | 810563-R05 | |
| 6-6 | R14 | 1 | RES,MET FLM,1/4W,1%,10K | 810229-103 | |
| 6-6 | R15 | 1 | CFR,1/4W,5%,2K | 810125-202 | |
| 6-6 | R16 | 1 | CFR,1/4W,5%,47K | 810125-473 | |
| 6-6 | R17 | 1 | CFR,1/4W,5%,3.3K | 810125-332 | |
| 6-6 | R18 | 1 | RES,MET FLM,1/4W,1%,100K | 810229-104 | |
| 6-6 | R19 | 1 | CFR,1/4W,5%,5.1K | 810125-512 | |
| 6-6 | R20 | 1 | RES,MET FLM,1/4W,1%,27.4K | 8102292742 | |
| 6-6 | R21 | 1 | RES,MET FLM,1/4W,1%,357K | 8102233573 | |
| 6-6 | R22 | 1 | RES,MET FLM,1/4W,1%,332 | 8102293320 | |
| 6-6 | R23 | 1 | CFR,1/4W,5%,47K | 810125-473 | |
| | R24 | | NOT USED | | |
| 6-6 | R25,R26 | 2 | CFR,1/4W,5%,47K | 810125-473 | |
| 6-6 | R27 | 1 | CFR,1/4W,5%,1K | 810125-102 | |
| 6-6 | R28 | 1 | CFR,1/4W,5%,4.7K | 810125-472 | |
| 6-6 | R29 | 1 | RES,3W,1%,.05,WW | 810563-R05 | |
| 6-6 | R30 | 1 | CFR,1/4W,5%,300K | 810125-304 | |
| 6-6 | R31,R32 | 2 | CFR,1/4W,5%,15K | 810125-153 | |
| 6-6 | R33 | 1 | CFR,1/4W,5%,1.5K | 810125-152 | |
| 6-6 | R34 | 1 | RES,MET FLM,1/4W,1%,10K | 810229-103 | |
| 6-6 | R35 | 1 | RES,MET FLM,1/4W,1%,51.1K | 8102295112 | |
| 6-6 | R36 | 1 | RES,MET FLM,1/4W,1%,200K | 810229-204 | |
| 6-6 | R37 | 1 | RES,MET FLM,1/4W,1%,100K | 810229-104 | |
| 6-6 | R38 | 1 | RES,MET FLM,1/4W,1%,150K | 810229-154 | |
| 6-6 | R39 | 1 | RES,MET FLM,1/4W,1%,10K | 810229-103 | |
| 6-6 | R40 | 1 | RES,WW,0.4W,1%,0.1 | 810591-0R1 | |
| 6-6 | R41 | 1 | RES,MET FLM,1/4W,1%,20K | 810229-203 | |
| 6-6 | R42 | 1 | RES,MET FLM,1/4W,1%,10K | 810229-103 | |
| 6-6 | R43 | 1 | CFR,1/4W,5%,47K | 810125-473 | |
| 6-6 | R44 | 1 | CFR,1/4W,5%,470K | 810125-474 | |
| 6-6 | R45 | 1 | RES,MTL FLM,1/4W,1%,150K | 810229-154 | |
| 6-6 | R46 | 1 | RES,MET FLM,1/8W,1%,34K | 810223-343 | |
| 6-6 | R47 | 1 | CFR,1/4W,5%,1K | 810125-102 | |
| 6-6 | R48 | 1 | RES,MET FLM,1/8W,0.25%,24.9K | 8102192492 | |
| 6-6 | R49 | 1 | RES,MET FLM,1/4W,1%,100K | 810229-104 | |

Table 6-6. Parts List - Power Supply Board CCA

| Fig No | Ref Desig. | Qty | Description | Part Number | Reference |
|--------------------|------------|-----|---------------------------------|-------------|-----------|
| 6-6 | R50 | 1 | CFR,1/4W,5%,1M | 810125-105 | |
| 6-6 | R51 | 1 | RES,MET FLM,1/8W,0.25%,20K | 810219-203 | |
| 6-6 | R52 | 1 | RES,MET FLM,1/4W,1%,100K | 810229-104 | |
| 6-6 | R53 | 1 | RES,MET FLM,1/4W,1%,9.31K | 8102299311 | |
| 6-6 | R54 | 1 | RES,MET FLM,1/4W,1%,100 | 810229-104 | |
| 6-6 | R55 | 1 | CFR,1/4W,5%,68K | 810125-683 | |
| 6-6 | R56 | 1 | CFR,1/4W,5%,910 | 810125-911 | |
| 6-6 | R57 | 1 | CFR,1/4W,5%,100 | 810125-101 | |
| 6-6 | R58 | 1 | RES,MET FLM,1/4W,1%,100K | 810229-104 | |
| 6-6 | R59 | 1 | CFR,1/4W,5%,6.2M | 810125-625 | |
| 6-6 | R60 | 1 | RES,MET FLM,1/4W,0.1%,82.5K | 8102218252 | |
| 6-6 | R61 | 1 | RES,MET FLM,1/4W,1%,75K | 810229-753 | |
| 6-6 | R62 | 1 | CFR,1/4W,5%,100 | 810125-101 | |
| 6-6 | R63 | 1 | RES,MET FLM,1/4W,1%,100K | 810229-104 | |
| 6-6 | R64 | 1 | RES,MET FLM,1/8W,0.25%,20K | 810219-203 | |
| 6-6 | R65 | 1 | CFR,1/4W,5%,240K | 810125-244 | |
| 6-6 | R66 | 1 | RES,MET FLM,1/4K,1%,26.1K | 8102232612 | |
| 6-6 | R67 | 1 | RES,MET FLM,1/4W,1%,20K | 810229-203 | |
| 6-6 | R68 | 1 | CFR,1/4W,5%,1M | 810125-105 | |
| 6-6 | R69 | 1 | RES,MET FLM,1/4W,1%,10K | 810229-103 | |
| 6-6 | R70 | 1 | RES,POT,TRMR,50K 20-TURN | 810336503Y | |
| 6-6 | R70-R73 | 4 | CFR,1/4W,5%,47K | 810125-473 | |
| 6-6 | R74 | 1 | RES,POT,CRMT,20K,20-TURN,TOP | 810336203Y | |
| 6-6 | RA1 | 1 | RES,SIP,.2W,2%,10K,10 BUS | 810900-103 | |
| 6-6 | RA2 | 1 | RES,SIP,.2W,2%,4.7K,10 ISOL | 810900472M | |
| Transistors | | | | | |
| 6-6 | Q1 | 1 | XSTR,FET,N-CHA,VN22 | 814006 | |
| 6-6 | Q2-Q4 | 3 | XSTR 2N4401 NPN SIL GENL PRP | 814103 | |
| 6-6 | Q5 | 1 | XSTR, MPS6514, NPN | 814112 | |
| 6-6 | Q6 | 1 | SCR,MCR68,100V,12A | 814900 | |
| 6-6 | Q7 | 1 | XSTRS PNP BJT 60V 10MA | 814111 | |
| 6-6 | Q8 | 1 | XSTR 2N4401 NPN SIL GENL PRP | 814103 | |
| 6-6 | Q9 | 1 | XSTR,VP0206N3,P-CHA,FET | 814001 | |
| 6-6 | Q10 | 1 | FET,P-CHNNL,25 AMP | 814002 | |
| 6-6 | Q11,Q12 | 2 | IC,FET,P CHNNL ENH-MODE RFP8P03 | 812272 | |
| 6-6 | Q13 | 1 | XSTR,VP0206N3,P-CHA,FET | 814001 | |
| 6-6 | Q14 | 1 | IC,FET,P CHNNL ENH-MODE RFP8P03 | 812272 | |
| 6-6 | Q15 | 1 | SCR,MCR68,100V,12A | 814900 | |
| 6-6 | Q16,Q17 | 2 | FET,N-CHNNL,3.0 AMP,VN0206 | 814005 | |
| 6-6 | Q18 | 1 | XSTR 2N4403 PNP SIL GENL PRP | 814104 | |
| 6-6 | Q19 | 1 | XSTRS NPN BJT 60V 10MA | 814110 | |
| | Q20 | | NOT USED | | |

Table 6-6. Parts List - Power Supply Board CCA

| Fig No | Ref Desig. | Qty | Description | Part Number | Reference |
|----------------------|------------|-----|------------------------------------|-------------|-----------------|
| 6-6 | Q21 | 1 | XSTR DARLINGTON MPS A13 | 814301 | |
| Connectors | | | | | |
| 6-6 | J1 | 1 | CONN HDR 2X25 LATCHING STR | 851062 | USE W/20-7065-2 |
| | | 1 | CONN HDR LATCHING, 50 CKT | 851087 | USE W/142329 |
| 6-6 | J2 | 1 | CONN HDR 4-WALL .1" X .1" CTR | 851006 | |
| 6-6 | J3,J4 | 2 | CONN 10A LKG PLZD HDR/HSG/CRP | 851051 | |
| Miscellaneous | | | | | |
| 6-6 | F1 | 1 | FUSE 3AG, 2A 1/4"X1 1/1/4" | 842013 | |
| 6-6 | F2 | 1 | FUSE,PICO,4A,125V,PC-MT | 842037 | |
| 6-6 | L1 | 2 | INDUCTOR TOROID | 10-3007-7 | |
| 6-6 | L2 | 1 | IDCTR AXIAL 56MH Q=23 | 815049 | |
| 6-6 | K1 | 1 | RLY DIP REED SPST N.O.10W | 812080 | |
| 6-6 | TP1-TP20 | 20 | TST PT,YEL,.063 DIA | 815064 | |
| 6-6 | T1 | 1 | XFMR PWR INV +/- 12V | 847069 | |
| 6-6 | XF1 | 2 | FUSE CL 5X20MM 3AG PCB MT | 845026 | |
| 6-6 | B1 | 1 | BTRY NICAD 4.8V 40MAH PC MT | 841018 | |
| | Ref | | Schematic, PC-2TX Power Supply CCA | 20-5054-1 | |

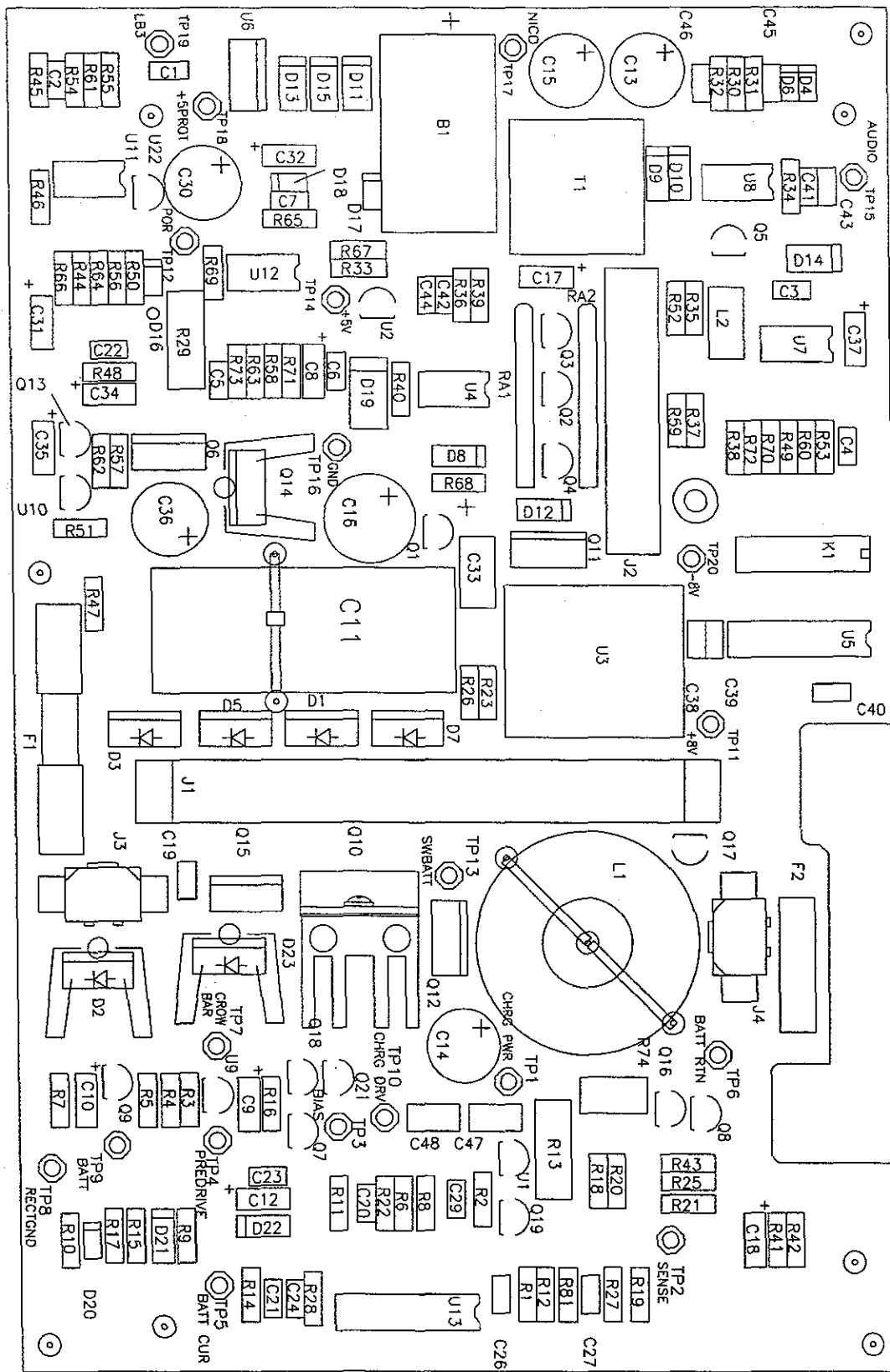


Figure 6-6. Parts Identification - Power Supply Board CCA

Table 6-7. Parts List - Display Board CCA

| Fig No Ref Desig. | Qty | Description | Part Number | Reference |
|----------------------------|---------|---|--------------------------------|---|
| 6-7 | X | CCA, PC-2TX DISPLAY (110V) PWB, PC-2TX DISPLAY | 142328 25-6012-7 | Fig 6-2/S2 Use on 142328 & 142340 |
| | | PWB, PC-2TX I/O PALLET PWB, PC-2TX (CE) | 25-6011-7 25-6010-7 | Use on 142340 Use on 142340 |
| Capacitors | | | | |
| 6-7 | C1,C2 | 2 | CAP,TANT,10V,10%,6.8UF,AX | 811116685A |
| 6-7 | C3 | 1 | CAP,CER,Z5U,50V,20%,.1UF AX | 811247104A |
| 6-7 | C4,C5 | 2 | CAP,CER,X7R,50V,10%,.01UF AX | 811246103A |
| 6-7 | C6,C7 | 2 | CAP,CER,Z5U,50V,20%,.1UF AX | 811247104A |
| | C8 | | NOT USED | |
| 6-7 | C9 | 1 | CAP,TANT,10V,10%,47UF,AX | 811116476A |
| 6-7 | C10 | 1 | CAP,CER,Z5U,50V,20%,.1UF AX | 811247104A |
| | C11 | | NOT USED | |
| 6-7 | C12 | 1 | CAP,CER,Z5U,50V,20%,.1UF AX | 811247104A |
| 6-7 | C13,C14 | 2 | CAP,CDR,100V,2%,22PF,COG,AX | 811257220A |
| 6-7 | C15,C16 | 2 | CAP,CER,Z5U,50V,20%,.1UF AX | 811247104A |
| | C17 | | NOT USED | |
| 6-7 | C18 | 1 | CAP,CER,X7R,50V,20%,0.001UF,AX | 811247102A |
| 6-7 | C19 | 1 | CAP,CER,Z5U,50V,20%,.1UF AX | 811247104A |
| Integrated Circuits | | | | |
| 6-7 | U1,U2 | 2 | IC,74C923,CMOS,20-KEY ENCDR | 812117 |
| 6-7 | U3 | 1 | IC,CMOS,RAM,32K X 8,SURF MT | 812276 |
| 6-7 | U4 | 1 | IC,CMOS,LCD CONT,SED1330F | 812274 |
| 6-7 | U5 | 1 | IC,7218C/7228C 8DIGT LED CTRL | 812197 |
| 6-7 | U6,U7 | 2 | DISPLAY,DOT MATRIX,HDSP-2531 | 815067 |
| | U8 | | NOT USED | |
| 6-7 | U9 | 1 | IC,HS COMOS/TTL LGC FAMILY | 812057 |
| 6-7 | U10,U11 | 2 | IC,74HC573 HS CMOS LGC FAMILY | 812139 |
| | U12 | | NOT USED | |
| 6-7 | U13 | 1 | IC,HS COMOS/TTL LGC FAMILY | 812057 |
| 6-7 | U14 | 1 | IC,CMOS,EQ COMPTR,8BIT,74HC688 | 812273 |
| Displays | | | | |
| 6-7 | DS1 | 1 | DSPLY,7 SEG,GRN,7.6 MM HT | 813319 |
| 6-7 | DS2-4 | 3 | DSPLY,7 SEG,GRN,10 MM HT | 813320 |
| 6-7 | DS5 | 1 | LED 4MM FL TOP GRN HIGH BRT | 813305 |
| 6-7 | DS6 | 1 | LED,4MM,FL TOP,YEL,HIGH BRT | 813403 |
| 6-7 | DS7 | 1 | LED,4MM,FL TOP,RED,HIGH BRT | 813400 |
| 6-7 | DS8 | 1 | LED,4MM,FL TOP,YEL,HIGH BRT | 813403 |
| 6-7 | DS9 | 1 | DSPLY,7 SEG,GRN,7.6 MM HT | 813319 |
| 6-7 | DS10-12 | 3 | DSPLY,7 SEG,GRN,10 MM HT | 813320 |
| 6-7 | DS13 | 1 | LED,4MM,FL TOP,YEL,HIGH BRT | 813403 |

Table 6-7. Parts List - Display Board CCA

| Fig No | Ref Desig. | Qty | Description | Part Number | Reference |
|----------------------|------------|-----|--------------------------------|-------------|---------------|
| 6-7 | DS14 | 1 | LED,4MM,FL TOP,RED,HIGH BRT | 813400 | |
| 6-7 | DS15 | 1 | LED,4MM,FL TOP,YEL,HIGH BRT | 813403 | |
| 6-7 | DS16 | 1 | LED 4MM FL TOP GRN HIGH BRT | 813305 | |
| Resistors | | | | | |
| 6-7 | RA1 | 1 | RES,ARRAY,SURFACE MT,16PIN,10K | 812277 | |
| 6-7 | RA2 | 1 | RES,ARRAY,DIP 39 2% 1/4W 8 SEP | 812085 | |
| 6-7 | RA3 | 1 | RES,ARRAY,SURFACE MT,16PIN,10K | 812277 | |
| 6-7 | R1-R3 | 3 | CFR,1/4W,5%,220 | 810125-221 | |
| 6-7 | R4 | 1 | CFR,1/4W,5%,0 | 810125-000 | |
| 6-7 | R5-R8 | 4 | CFR,1/4W,5%,10K | 810125-103 | |
| 6-7 | R9-R11 | 3 | CFR,1/4W,5%,220 | 810125-221 | |
| 6-7 | R12 | 1 | CFR,1/4W,5%,10K | 810125-103 | |
| 6-7 | R13 | 1 | CFR,1/4W,5%,0 | 810125-000 | |
| Diodes | | | | | |
| 6-7 | D1-D4 | 4 | DIO SILICONE SWITCHING 75V | 813500 | |
| 6-7 | D5-D8 | 4 | LED 4MM, FL TOP GRN, HIGH BRT | 813305 | |
| 6-7 | D9-D13 | 5 | DIO SILICONE SWITCHING 75V | 813500 | |
| Transistor | | | | | |
| 6-7 | Q1 | 1 | XSTR,SURFACE MT,2N4401 | 814901 | |
| Connectors | | | | | |
| 6-7 | J1 | 1 | CONN,UNSHRD,RT ANGLE,1X18 | 851086 | |
| 6-7 | J2 | 1 | CONN,UNSHRD,HDR,2X25 | 851084 | |
| 6-7 | J3 | 1 | CONN,UNSHRD,RT ANGLE,1X14 | 851085 | |
| Miscellaneous | | | | | |
| 6-7 | Y1 | 1 | XTAL,MIPRCS,ATCUT,10MHZ,M49 | 815075 | |
| 6-7 | XDS1 | 1 | SPCR,SIP,2PIN,0.20SP | 805088 | |
| 6-7 | XDS2-4 | 3 | SPCR,SIP,2PIN,0.30SP | 805087 | |
| 6-7 | XU6,7 | 2 | SPCR,DIP,14 PIN,0.06SP | 805089 | |
| 6-7 | XDS9 | 1 | SPCR,SIP,2PIN,0.20SP | 805088 | |
| 6-7 | XDS10-12 | 3 | SPCR,SIP,2PIN,0.30SP | 805089 | |
| | Ref | | Schematic, Display Board | 20-5049-1 | |
| | | 2 | SPCR, PC-2TX, PCB DISPLAY | 20-2395-7 | Use on 142328 |

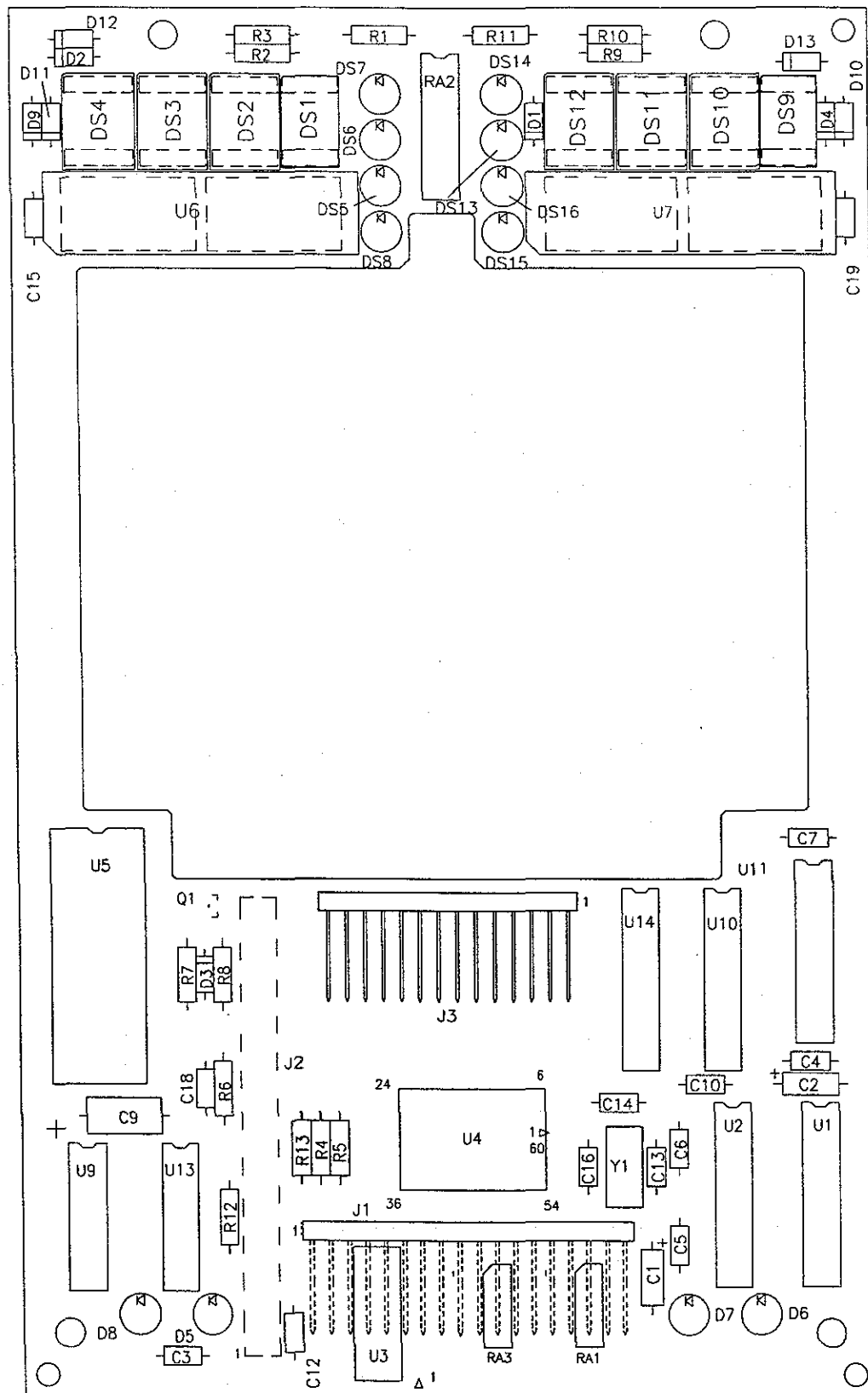


Figure 6-7. Parts Identification - Display Board CCA

PC-2TX

Table 6-8. Parts List - Logic Board CCA

| Fig No | Ref Desig. | Qty | Description | Part Number | Reference |
|-------------------|------------|-----|--------------------------------|-------------|--------------|
| 6-8 | | X | CCA, PC-2TX LOGIC (110V) | 143181 | Fig 6-2/S2 |
| 6-8 | | X | CCA, PC-2TX LOGIC (220V) | 143182 | Fig 6-1/S2 |
| 6-8 | | X | LOGIC, PC-2TX, PWB (220V) | 25-6014-1 | |
| Capacitors | | | | | |
| 6-8 | C1,C2 | 2 | CAP,CER,COG,50V,15%,30PF,AX | 811245300A | |
| 6-8 | C3,C4 | 2 | CAP,TANT,10V,10%,10UF,AX | 811116106A | |
| 6-8 | C5 | 1 | CAP,TANT,20V,20%,4.7UF,AX | 811137475A | |
| 6-8 | C6 | 1 | CAP,CER,Z5U,50V,20%,0.22UF,AX | 811247224A | |
| 6-8 | C7 | 1 | CAP,CER,X7R,100V,10%,820PF,AX | 811256821A | |
| 6-8 | C8-C15 | 8 | CAP,CER,X7R,50V,10%,.01UF,AX | 811246103A | |
| 6-8 | C8-C9 | 2 | CAP,CER,Z5U,50V,20%,.1UF,AX | 811247104A | USE W/143182 |
| 6-8 | C10-C12 | 3 | CAP,CER,X7R,50V,10%,.01UF,AX | 811246103A | USE W/143182 |
| 6-8 | C13-C15 | 3 | CAP,CER,Z5U,50V,20%,.1UF,AX | 811247104A | USE W/143182 |
| 6-8 | C16 | 1 | CAP,TANT,10V,10%,10UF,AX | 811116106A | |
| 6-8 | C17-C25 | 9 | CAP,CER,X7R,50V,10%,.01UF,AX | 811246103A | |
| 6-8 | C17 | 1 | CAP,CER,50V,20%,0.1UF,RAD | 811247104F | USE W/143182 |
| 6-8 | C18 | 1 | CAP,CER,X7R,50V,10%,.01UF,AX | 811246103A | USE W/143182 |
| 6-8 | C19 | 1 | CAP,CER,Z5U,50V,20%,.1UF,AX | 811247104A | USE W/143182 |
| 6-8 | C20,C21 | 2 | CAP,CER,X7R,50V,10%,.01UF,AX | 811246103A | USE W/143182 |
| 6-8 | C22 | 1 | CAP,CER,Z5U,50V,20%,.1UF,AX | 811247104A | USE W/143182 |
| 6-8 | C23-C25 | 3 | CAP,CER,X7R,50V,10%,.01UF,AX | 811246103A | USE W/143182 |
| 6-8 | C26 | 1 | CAP,CER,100V, 2%, 22PF, COG,AX | 811257220A | |
| 6-8 | C27 | 1 | CAP,CER,COG,100V,10%,10PF,AX | 811256100A | |
| 6-8 | C28 | 1 | CAP,CER,Z5U,50V,20%,.22UF,AX | 811247224A | |
| 6-8 | C29 | 1 | CAP,CER,Z5U,50V,20%,.1UF,AX | 811247104A | |
| | C30 | | NOT USED | | |
| 6-8 | C31 | 1 | CAP,CER,Z5U,50V,20%,.1UF,AX | 811247104A | |
| 6-8 | C32 | 1 | CAP,CER,Z5U,50V,20%,.47UF,AX | 811247474A | |
| 6-8 | C33 | 1 | CAP,CER,X7R,50V,10%,.01UF,AX | 811246103A | |
| 6-8 | C34 | 1 | CAP,CER,Z5U,50V,20%,.1UF,AX | 811247104A | |
| 6-8 | C34 | 1 | CAP,CER,50V,20%,0.1UF,RAD | 811247104F | USE W/143182 |
| 6-8 | C35 | 1 | CAP,CER,COG,50V,20%,15PF,AX | 811247150A | |
| 6-8 | C36 | 1 | CAP,CER,COG,50V,10%,100PF,AX | 811246101A | |
| 6-8 | C37 | 1 | CAP,TANT,20V,10%,1UF,AX | 811136105A | |
| 6-8 | C38 | 1 | CAP,CER,X7R,50V,10%,.01UF,AX | 811246103A | |
| 6-8 | C39 | 1 | CAP,CER,COG,50V,5%,220PF,AX | 811245221A | |
| 6-8 | C40-C43 | 4 | CAP,CER,Z5U,50V,20%,0.1UF,AX | 811247104A | |
| 6-8 | C44,C45 | 2 | CAP,CER,X7R,50V,10%,0.01UF,AX | 811246103A | |
| | C46-C48 | | NOT USED | | |
| 6-8 | C49 | 1 | CAP,TANT,10V,10%,100UF,AX | 811116107A | |
| 6-8 | C50 | 1 | CAP,CER,Z5U,50V,20%,.1UF,AX | 811247104A | |
| 6-8 | C51-C59 | 9 | CAP,CER,X7R,50V,10%,0.01UF,AX | 811246103A | |

Table 6-8. Parts List - Logic Board CCA

| Fig No | Ref Desig. | Qty | Description | Part Number | Reference |
|----------------------------|------------|-----|--------------------------------|-------------|-----------------|
| 6-8 | C51 | 1 | CAP,CER,50V,20%,0.1UF,RAD | 811247104F | USE W/143182 |
| 6-8 | C53-C54 | 2 | CAP,CER,50V,20%,0.1UF,RAD | 811247104F | USE W/143182 |
| 6-8 | C57 | 1 | CAP,CER,50V,20%,0.1UF,RAD | 811247104F | USE W/143182 |
| 6-8 | C60 | 1 | CAP,CER,X7R,100V,10%,820PF,AX | 811256821A | |
| 6-8 | C101-C106 | 6 | CAP,NPO,50V,1000PF,RAD | 811946-102 | USE W/143182 |
| 6-8 | C107 | 1 | CAP,CER,50V,20%,0.1UF,RAD | 811247104F | USE W/143182 |
| 6-8 | C108-C109 | 2 | CAP,NPO,50V,1000PF,RAD | 811946-102 | USE W/143182 |
| 6-8 | C111 | 1 | CAP,NPO,50V,1000PF,RAD | 811946-102 | USE W/143182 |
| 6-8 | CA1 | 1 | CAP 50V 20% 0.01UF SIP | 811947-103 | |
| Diodes | | | | | |
| 6-8 | D1 | 1 | DIO SILICONE SWITCHING 75V | 813500 | |
| 6-8 | D2 | 1 | DIO 1N5711 SCHOTTKY | 813019 | |
| | D3 | | NOT USED | | |
| 6-8 | D4,D5 | 2 | DIO SILICONE SWITCHING 75V | 813500 | |
| 6-8 | D6 | 1 | DIO 1N5711 SCHOTTKY | 813019 | |
| 6-8 | D8 | 1 | DIO SILICONE SWITCHING 75V | 813500 | |
| 6-8 | D9 | 1 | DIO 1N5711 SCHOTTKY | 813019 | |
| 6-8 | D11 | 1 | DIO ZENER 1N5343 7.5V | 813005 | |
| Transistors | | | | | |
| 6-8 | Q1-Q3 | 3 | FET,N-CHNNL,3.0 AMP,VN0206 | 814005 | |
| | Q4,Q5 | | NOT USED | | |
| 6-8 | Q6 | 1 | XSTR,FET,N-CHA,VN22 | 814006 | |
| Integrated Circuits | | | | | |
| 6-8 | U1 | 1 | IC,80C188 EMBEDDED PROCESSOR | 812260 | |
| 6-8 | U2,U3 | 2 | IC,LT1078,DUAL OP-AMP | 812278 | USE W/143181 |
| 6-8 | U2,U3 | 2 | IC,27M7,500UV,OP-AMP | 812265 | USE W/25-7002-1 |
| 6-8 | U4 | 1 | IC,CMOS VOLTAGE CONVERTER | 812061 | |
| 6-8 | U5 | 1 | IC,74HC4060 HS CMOS LGC FAMILY | 812095 | |
| 6-8 | U6 | 1 | IC,74ACT573,OCTAL LATCH | 812227 | |
| 6-8 | U6 | 1 | IC,74ACTQ573,QUIET OCTAL LATCH | 812363 | USE W/143182 |
| 6-8 | U7 | | NOT USED | | |
| 6-8 | U8 | 1 | IC,STATIC RAM,128X8 | 812249 | |
| 6-8 | U9 | 1 | IC,74HC245,HS CMOS LGC FAMILY | 812138 | |
| 6-8 | U10 | 1 | IC,74ACT573,OCTAL LATCH | 812227 | |
| 6-8 | U10 | 1 | IC,74ACTQ573,QUIET OCTAL LATCH | 812363 | USE W/143182 |
| 6-8 | U11 | 1 | IC,74HC32,HS CMOS LGC FAMILY | 812103 | |
| 6-8 | U12 | 1 | IC,74ACT04,HEX INVERTOR | 812258 | |
| 6-8 | U13 | 2 | IC,74ACT574,OCTAL FLIP FLOP | 812259 | |
| 6-8 | U13 | 2 | IC, HS CMOS/TTL LGC FAMILY | 812122 | USE W/143182 |
| 6-8 | U14 | | NOT USED | | |

Table 6-8. Parts List - Logic Board CCA

| Fig No | Ref Desig. | Qty | Description | Part Number | Reference |
|-----------|------------|-----|--------------------------------|-------------|--------------|
| 6-8 | U15 | 1 | IC,74HC573,HS CMOS LGC FAMILY | 812139 | USE W/143182 |
| 6-8 | U16 | 2 | IC,74ACT574,OCTAL FLIP FLOP | 812259 | |
| 6-8 | U16 | 2 | IC, HS CMOS/TTL LGC FAMILY | 812122 | |
| 6-8 | U17 | 1 | IC,74ACT08,QUAD 2 IN AND GATE | 812255 | |
| 6-8 | U18 | 1 | IC,74HCT367,HEX BUFFER 3 STATE | 812252 | |
| 6-8 | U19 | 1 | IC,74ACT14,HEX INV,SCHMIDT | 812262 | |
| 6-8 | U20 | 1 | IC,74ACT04,HEX INVERTOR | 812258 | |
| 6-8 | U21 | 1 | IC,74HC132 HS CMOS LGC FAMILY | 812205 | |
| 6-8 | U22 | 1 | IC,74ACT139,2 TO 4 LINE DECODR | 812254 | |
| 6-8 | U23 | 1 | IC,74ACT14,HEX INV,SCHMIDT | 812262 | |
| 6-8 | U24 | 1 | IC,LM358 DUAL OP AMP | 812042 | |
| 6-8 | U25 | 1 | EPLD,PRGM,CER,VER.EL04244 | 20-1037-1 | |
| 6-8 | U26 | 1 | IC,CMOS,8-BIT,BFR,MULT,DAC | 812245 | |
| 6-8 | U27 | 1 | IC,PRGMMBL INTRPT CONTROLLER | 812243 | |
| 6-8 | U28 | 1 | IC,2950,5V REGULATOR | 812229 | |
| 6-8 | U29 | 1 | IC,CLOCK,REAL TIME,WITH RAM | 812248 | |
| 6-8 | U30 | 1 | IC,PRGM LOGIC,TX,V1.85B | 143367 | |
| 6-8 | U31 | 1 | IC,PRGM LOGIC,TX,V1.85A | 143367 | |
| 6-8 | U32 | 1 | IC,ADC0808,8-BIT A/D CONVERTER | 812251 | |
| | U33 | | NOT USED | | |
| 6-8 | U34 | 1 | IC,3503,2.5 VOLT REF | 812022 | |
| 6-8 | U35 | 1 | IC,74ACT32,QUAD2 INPUT OR GATE | 812220 | |
| | U36 | | NOT USED | | |
| 6-8 | U37 | 1 | IC,74ACT32,QUAD2 INPUT OR GATE | 812220 | |
| Resistors | | | | | |
| 6-8 | R1 | 1 | CFR,1/4W,5%,10K | 810125-103 | |
| 6-8 | R2,R3 | 2 | RES,MET FLM,1/8W,0.25%,20K | 810219-203 | |
| 6-8 | R4,R5 | 2 | RES,MET FLM,1/4W,0.1%,2K | 810221-202 | |
| 6-8 | R6 | 1 | RES,MET FLM,1/4W,.1%,100K | 8102211003 | |
| 6-8 | R7 | 1 | RES,MET FLM,1/8W,.25%,182K | 8102191823 | |
| 6-8 | R8 | 1 | CFR,1/4W,5%,100K | 810125-104 | |
| 6-8 | R9 | 1 | CFR,1/4W,5%,10K | 810125-103 | |
| 6-8 | R10 | 1 | CFR,1/4W,5%,3.3.M | 810125-335 | |
| 6-8 | R11 | 1 | CFR,1/4W,5%,1K | 810125-102 | |
| 6-8 | R12,R13 | 2 | RES,MET FLM,1/4W,1%,51.1K | 8102295112 | |
| 6-8 | R14 | 1 | RES,MET FLM,1/4W,.1%,100K | 8102211003 | |
| 6-8 | R15 | 1 | RES,MET FLM,1/4W,1%,82.5K | 8102298252 | |
| 6-8 | R16 | 1 | CFR,1/4W,5%,10K | 810125-103 | |
| 6-8 | R17 | 1 | RES,MET FLM,1/8W,.25%,182K | 8102191823 | |
| 6-8 | R18,R19 | 2 | RES,MET FLM,1/4W,.1%,100K | 8102211003 | |
| 6-8 | R20 | 1 | RES,MET FLM,1/4W,1%,332K | 8102233323 | |
| 6-8 | R21 | 1 | CFR,1/4W,5%,100K | 810125-104 | |

Table 6-8. Parts List - Logic Board CCA

| Fig No | Ref Desig. | Qty | Description | Part Number | Reference |
|----------------------|------------|-----|---------------------------------|-------------|-----------------|
| 6-8 | R22 | 1 | CFR,1/4W,5%,470K | 810125-474 | |
| 6-8 | R23 | 1 | RES,MET FLM,1/8W,.25%,182K | 8102191823 | |
| 6-8 | R24 | 1 | CFR,1/4W,5%,18M | 810125-186 | |
| 6-8 | R25 | 1 | RES,MET FLM,1/4W,.1%,40.2K | 8102214022 | |
| 6-8 | R26 | 1 | CFR,1/4W,5%,390K | 810125-394 | |
| 6-8 | R27 | 1 | CFR,1/4W,5%,100K | 810125-104 | |
| 6-8 | R28,R29 | 2 | CFR,1/4W,5%,10K | 810125-103 | |
| 6-8 | R30 | 1 | CFR,1/4W,5%,2.2M | 810125-225 | |
| 6-8 | R31 | 1 | CFR,1/4W,5%,200K | 810125-204 | |
| 6-8 | R32 | 1 | CFR,1/4W,5%,100K | 810125-104 | |
| 6-8 | R33 | 1 | RES,MET FLM,1/4W,1%,100K | 810229-104 | |
| 6-8 | R34 | 1 | RES,MET FLM,1/4W,1%,332K | 8102233323 | |
| 6-8 | R35 | 1 | CFR,1/4W,5%,47K | 810125-473 | |
| 6-8 | R36 | 1 | CFR,1/4W,5%,18M | 810125-186 | |
| 6-8 | R37 | 1 | CFR,1/4W,5%,10K | 810125-103 | |
| 6-8 | R38 | 1 | CFR,1/4W,5%,4.7K | 810125-472 | |
| 6-8 | R39 | 1 | CFR,1/4W,5%,10K | 810125-103 | |
| 6-8 | R40 | 1 | RES,MET FLM,1/4W,1%,15K | 810229-153 | |
| | R41,R42 | | NOT USED | | |
| 6-8 | R43 | 1 | CFR,1/4W,5%,56 | 810125-560 | |
| 6-8 | R44 | 1 | CFR,1/4W,5%,200K | 810125-204 | |
| | R45-R50 | | NOT USED | | |
| 6-8 | R51 | 1 | CFR,1/4W,5%,10K | 810125-103 | |
| | R52-R58 | | NOT USED | | |
| 6-8 | R59-R62 | 4 | CFR,1/4W,5%,100 | 810125-101 | |
| 6-8 | R63 | 1 | CFR,1/4W,5%,1K | 810125-102 | |
| 6-8 | RA1-RA6 | 6 | RES,SIP,0.2W,2%,47K,10 BUS | 810900-473 | |
| 6-8 | RA7 | 1 | RES,SIP,0.2W,2%,100K,8 PIN ISOL | 8109941041 | |
| Miscellaneous | | | | | |
| 6-8 | J1 | 1 | HARNESS ASSY,LOGIC,PC-2TX | 25-3000-1 | USE W/25-7002-1 |
| 6-8 | J1 | 1 | HARNESS ASSY,LOGIC,PC-2TX | 20-1278-1 | |
| 6-8 | J2 | 1 | CONN,SKT,2X25,BD-MT | 856089 | |
| 6-8 | J3 | 1 | CONN,SKT,2X27,BD-MT | 856090 | |
| 6-8 | L1 | 1 | IDCTR,4.7UH,10%,1.2 OHM AXIAL | 815070 | |
| 6-8 | Y1 | 1 | XTAL,32MHZ,3RD OVERTONE,199H1 | 815072 | |
| 6-8 | Y2 | 1 | XTAL,TUN FK RESN,32.786 KHZ | 815060 | |
| 6-8 | Y3 | 1 | RESONATOR,PIEZO ELECTRIC 480KHZ | 815012 | |
| 6-8 | XU1 | 1 | CONN,SKT,PLCC,84 PIN | 856085 | |
| 6-8 | XU7 | 1 | SKT,IC,PLCC,32 PIN | 856035 | |
| 6-8 | XU14 | 1 | SKT,IC,PLCC,32 PIN | 856035 | |
| 6-8 | XU25 | 1 | SKT,LOW,PF DIP OPEN FR 24 PIN | 815002-4 | |
| 6-8 | XU30,XU31 | 2 | SKT,IC,PLCC,32 PIN | 856035 | |

PC-2TX

Table 6-8. Parts List - Logic Board CCA

| Fig No | Ref Desig. | Qty | Description | Part Number | Reference |
|--------|------------|-----|---------------------------------|-------------|-----------|
| 6-8 | XW1-XW5 | 5 | PRGMG JMPR 2-POSN SHORTING .1 | 815037 | |
| 6-8 | XW7 | 1 | PRGMG JMPR 2-POSN SHORTING .1 | 815037 | |
| 6-8 | W1-W7 | 7 | CONN,UNSHRD HDR,1X3 | 851083 | |
| | | 1 | Cable Assy, Logic Intfc, PC-2TX | 25-3000-1 | |
| | | Ref | Schematic, PC-2TX Logic Board | 20-5048-1 | |



PC-2TX

Table 6-9. Parts List - Motor Controller Board CCA

| Fig No | Ref Desig | Qty | Description | Part Number | Reference |
|-------------------|-----------|-----|---------------------------------|-------------|------------|
| 6-9 | 480 | X | CCA, PC-2TX Contr. Board (110V) | 142330 | Fig 6-2/S2 |
| 6-9 | 481 | X | CCA, PC-2TX Contr. Board (220V) | 142336 | Fig 6-2/S2 |
| Capacitors | | | | | |
| 6-9 | C1 | 1 | CAP,CER,50V,20%,0.1UF,RAD | 811247-104 | |
| 6-9 | C2 | 1 | CAP,CER,Z5U,50V,20%,0.1 UF,AX | 811247104A | |
| 6-9 | C3 | 1 | CAP,CER,X7R,50V,10%,1000PF RAD | 811246-102 | |
| | C4,C5 | | NOT USED | | |
| 6-9 | C6 | 1 | CAP,CER,50V,20%,0.1UF,RAD | 811247-104 | |
| 6-9 | C7 | 1 | CAP,50V,10%,0.047UF,RAD | 811246-473 | |
| | C8 | | NOT USED | | |
| 6-9 | C9 | 1 | CAP,CER,X7R,50V,20%,.001UF,AX | 811247102A | |
| 6-9 | C10 | 1 | CAP,CER,X7R,50V,10%,1000PF RAD | 811246-102 | |
| 6-9 | C11 | 1 | CAP,CER,100V,2%,100PF,.1LS | 811254-101 | |
| 6-9 | C12 | 1 | CAP,CER,X7R,50V,10%,1000PF RAD | 811246-102 | |
| 6-9 | C13 | 1 | CAP,50V,10%,0.047UF,RAD | 811246-473 | |
| 6-9 | C14-C18 | 5 | CAP,CER,100V,2%,100PF,.1LS | 811254-101 | |
| 6-9 | C19-C22 | 4 | CAP,CER,X7R,50V,10%,1000PF RAD | 811246-102 | |
| 6-9 | C23 | 1 | CAP,TANT,29V,20%,4.7UF,AX | 811137475A | |
| 6-9 | C24 | 1 | CAP,TANT,20V,10%,1UF,AX | 811136105A | |
| 6-9 | C25 | 1 | CAP,TANT,29V,20%,4.7UF,AX | 811137475A | |
| 6-9 | C26 | 1 | CAP,TANT,10V,10%,10UF,AX | 811116106A | |
| 6-9 | C27 | 1 | CAP,TANT,20V,10%,1UF,AX | 811136105A | |
| 6-9 | C28-C31 | 4 | CAP,TANT,10V,10%,39UF,AX | 811116396A | |
| 6-9 | C32,C33 | 2 | CAP,TANT,20V,10%,1UF,AX | 811136105A | |
| 6-9 | C34 | 1 | CAP,CER,X7R,50V,20%,0.001UF,AX | 811247102A | |
| 6-9 | C35,C36 | 2 | CAP,CER,COG,50V,15%,30PF,AX | 811245300A | |
| 6-9 | C35,C36 | 2 | CAP,CER,Z5U,50V,20%,.1UF,AX | 811247104A | |
| 6-9 | C37 | 1 | CAP,TANT,10V,10%,10UF,AX | 811116106A | |
| | C38 | | NOT USED | | |
| 6-9 | C39-C42 | 4 | CAP,CER,X7R,50V,20%,0.001UF,AX | 811247102A | |
| 6-9 | C43 | 1 | CAP,TANT,10V,10%,10UF,AX | 811116106A | |
| 6-9 | C44 | 1 | CAP,CER,X7R,50V,20%,0.001UF,AX | 811247102A | |
| | C45 | | NOT USED | | |
| 6-9 | C46,C47 | 2 | CAP,CER,X7R,50V,20%,0.001UF,AX | 811247102A | |
| 6-9 | C48 | 1 | CAP,CER,Z5U,50V,20%,0.1UF,AX | 811247104A | |
| 6-9 | C49 | 1 | CAP,CER,X7R,50V,20%,0.001UF,AX | 811247102A | |
| 6-9 | C50,C51 | 2 | CAP,CER,Z5U,50V,20%,0.1UF,AX | 811247104A | |
| 6-9 | C52 | 1 | CAP,CER,Z5U,50V,20%,0.22UF,AX | 811247224A | |
| 6-9 | C53 | 1 | CAP,CER,X7R,50V,10%,0.01UF,AX | 811246103A | |
| 6-9 | C54 | 1 | CAP,CER,Z5U,50V,20%,0.22UF,AX | 811247224A | |
| 6-9 | C55 | 1 | CAP,CER,X7R,50V,10%,0.01UF,AX | 811246103A | |
| 6-9 | C56,C57 | 2 | CAP,CER,Z5U,50V,20%,0.1UF,AX | 811247104A | |

Table 6-9. Parts List - Motor Controller Board CCA

| Fig No | Ref Desig | Qty | Description | Part Number | Reference |
|---------------------|-----------|-----|--------------------------------|-------------|--------------|
| 6-9 | C58-C66 | 9 | CAP,CER,X7R,50V,20%,.001UF,AX | 811247102A | |
| 6-9 | C67 | 1 | CAP,TANT,10V,10%,39UF,AX | 811116396A | |
| 6-9 | C68 | 1 | CAP,TANT,10V,10%,10UF,AX | 811116106A | |
| | C69-C73 | | NOT USED | | |
| 6-9 | C74,C75 | 2 | CAP,CER,COG,50V,15%,30PF,AX | 811245300A | |
| 6-9 | C100-C107 | 8 | CAP,NPO,50V,1000PF,RAD | 811946-102 | |
| Integrated Circuits | | | | | |
| 6-9 | U1,U2 | 2 | IC,LT1079,QUAD OP AMP | 812062 | USE W/142336 |
| 6-9 | U3,U4 | 2 | IC,SWITCHING REGTR,MAX750 | 812275 | |
| | U5 | | NOT USED | | |
| 6-9 | U6 | 1 | IC,TLC27M2A,VIO,5MV,OP-AMP | 812219 | |
| 6-9 | U7 | 1 | IC,CMOS VOLTGE CONVERTER | 812061 | |
| 6-9 | U8 | 1 | IC,74ACT32,QUAD2 INPUT OR GATE | 812220 | |
| 6-9 | U9 | 2 | IC,74ACT08,QUAD 2 IN AND GATE | 812255 | |
| 6-9 | U10 | 1 | IC,74ACT20,DUAL 4-INPUT NAND | 812263 | |
| 6-9 | U11 | 1 | IC,74ACT138,3 TO 8 LINE DECODR | 812256 | |
| 6-9 | U12 | 1 | IC,74HCOO QUAD 2 INP CMOS NAND | 812171 | |
| 6-9 | U13 | 1 | IC,74ACT32,QUAD2 INPUT OR GATE | 812220 | |
| 6-9 | U14 | 1 | IC,HS CMOS/TTL LGC FAMILY | 812057 | |
| 6-9 | U15 | 1 | IC,HS CMOS/TTL LGC FAMILY | 812122 | |
| 6-9 | U16 | 1 | IC,80C198 MICROPROCESSOR | 812250 | |
| 6-9 | U17,U18 | 2 | IC,74HC02,HS CMOS LGC FAMILY | 812203 | |
| 6-9 | U19 | 1 | IC,PRGM CNTL,PC-2TX, VER 2.31 | 20-1315-1 | |
| 6-9 | U20,U21 | 2 | IC,74ACT573,OCTAL LATCH | 812227 | |
| 6-9 | U20,U21 | 2 | IC,74ACTQ573,QUIET OCTALLATCH | 812363 | |
| 6-9 | U22 | 1 | IC,HS CMOS/TTL LGC FAMILY | 812122 | |
| 6-9 | U23 | 1 | IC,2950,5V REGULATOR | 812229 | |
| 6-9 | U24 | 1 | IC,74ACT574,OCTAL FLIP FLOP | 812259 | |
| 6-9 | U25,U26 | 2 | IC,40109 V LVL SHF | 812209 | |
| 6-9 | U27 | 1 | IC,8K X 8,SRAM,.3 PKG | 812231 | |
| | U28,U29 | | NOT USED | | |
| 6-9 | U30-U33 | 4 | IC,FET,N-CHAN,14PIN DIP,VN3206 | 812271 | |
| 6-9 | U34 | 1 | IC,74HCOO QUAD 2 INP CMOS NAND | 812171 | |
| 6-9 | U35,U36 | 2 | IC,VQ 7254 QUAD MOSFET | 812208 | |
| Resistors | | | | | |
| 6-9 | R1 | 1 | CFR,1/4W,5%,240K | 810125-244 | |
| 6-9 | R2 | 1 | RES,MET FLM,1/4W,1%,20K | 810229-203 | |
| 6-9 | R3 | 1 | CFR,1/4W,5%,240K | 810125-244 | |
| 6-9 | R4 | 1 | RES,MET FLM,1/4W,1%,20K | 810229-203 | |
| 6-9 | R5 | 1 | RES,MET FLM,1/4W,1%,1K | 810229-102 | |
| 6-9 | R6 | 1 | RES,MET FLM,1/4W,1%,511K | 8102295113 | |
| 6-9 | R7 | 1 | RES,MET FLM,1/4W,1%,10K | 810229-103 | |

Table 6-9. Parts List - Motor Controller Board CCA

| Fig No | Ref Desig | Qty | Description | Part Number | Reference |
|--------|-----------|-----|------------------------------|-------------|-----------|
| 6-9 | R8 | 1 | RES,MET FLM,1/4W,1%,511K | 8102295113 | |
| 6-9 | R9 | 1 | RES,MET FLM,1/4W,1%,10K | 810229-103 | |
| 6-9 | R10 | 1 | RES,MET FLM,1/4W,1%,511K | 8102295113 | |
| 6-9 | R11 | 1 | RES,MET FLM,1/4W,1%,1K | 810229-102 | |
| 6-9 | R12 | 1 | RES,MET FLM,1/4W,1%,20K | 810229-203 | |
| 6-9 | R13 | 1 | RES,MET FLM,1/4W,1%,1K | 810229-102 | |
| 6-9 | R14 | 1 | RES,MET FLM,1/4W,1%,511K | 8102295113 | |
| 6-9 | R15 | 1 | RES,MET FLM,1/4W,1%,20K | 810229-203 | |
| 6-9 | R16-R18 | 3 | RES,MET FLM,1/4W,1%,1K | 810229-102 | |
| 6-9 | R19 | 1 | RES,1/4W,1%,3.32K | 8102233321 | |
| 6-9 | R20,R21 | 2 | RES,MET FLM,1/4W,1%,1K | 810229-102 | |
| 6-9 | R22 | 1 | RES,MET FLM,1/4W,1%,2K | 810229-202 | |
| 6-9 | R23 | 1 | CFR,1/4W,5%,150K | 810125-151 | |
| 6-9 | R24 | 1 | RES,MET FLM,1/4W,1%,1K | 810229-102 | |
| 6-9 | R25 | 1 | RES,1/4W,1%,3.32K | 8102233321 | |
| 6-9 | R26 | 1 | CFR,1/4W,5%,3.9K | 810125-392 | |
| 6-9 | R27 | 1 | RES,MET FLM,1/8W,0.25%,1.47K | 8102191471 | |
| 6-9 | R28 | 1 | RES,MET FLM,1/4W,1%,1K | 810229-102 | |
| 6-9 | R29 | 1 | RES,MET FLM,1/4W,1%,2K | 810229-202 | |
| 6-9 | R30 | 1 | CFR,1/4W,5%,150K | 810125-151 | |
| | R31 | | NOT USED | | |
| 6-9 | R32 | 1 | RES,MET FLM,1/8W,0.25%,182K | 8102191433 | |
| 6-9 | R33 | 1 | CFR,1/4W,5%,3.9K | 810125-392 | |
| 6-9 | R34 | 1 | RES,MET FLM,1/8W,0.25%,1.47K | 8102191471 | |
| 6-9 | R35 | 1 | RES,MET FLM,1/4W,1%,10K | 810229-103 | |
| 6-9 | R36 | 1 | RES,MET FLM,1/4W,1%,200K | 8102191623 | |
| 6-9 | R37 | 1 | CFR,1/4W,5%,510K | 810125-514 | |
| 6-9 | R38 | 1 | RES,MET FLM,1/8W,0.25%,182K | 8102191433 | |
| 6-9 | R39 | 1 | RES,WW,0.4W,1%,0.25 | 810591-R25 | |
| 6-9 | R40 | 1 | RES,MET FLM,1/4W,1%,200K | 8102191623 | |
| 6-9 | R41 | 1 | RES,WW,0.4W,1%,0.25 | 810591-R25 | |
| 6-9 | R42 | 1 | RES,MET FLM,1/4W,1%,100K | 810229-104 | |
| 6-9 | R43 | 1 | CFR,1/4W,5%,510K | 810125-514 | |
| 6-9 | R44-R47 | 4 | RES,MET FLM,1/4W,1%,100K | 810229-104 | |
| | R48 | | NOT USED | | |
| 6-9 | R49 | 1 | RES,MET FLM,1/4W,1%,100K | 810229-104 | |
| | R50 | | NOT USED | | |
| 6-9 | R51 | 1 | CFR,1/4W,5%,4.7K | 810125-472 | |
| 6-9 | R52 | 1 | RES,MET FLM,1/4W,1%,10K | 810229-103 | |
| 6-9 | R53 | 1 | CFR,1/4W,5%,4.7K | 810125-472 | |
| 6-9 | R54 | 1 | RES,MET FLM,1/4W,1%,100K | 810229-104 | |
| | R55,R56 | | NOT USED | | |

Table 6-9. Parts List - Motor Controller Board CCA

| Fig No | Ref Desig | Qty | Description | Part Number | Reference |
|----------------------|-----------|-----|------------------------------------|-------------|-----------|
| 6-9 | R57 | 1 | RES,MET FLM,1/4W,1%,10K | 810229-103 | |
| 6-9 | R58,R59 | 2 | RES,MET FLM,1/4W,1%,100K | 810229-104 | |
| 6-9 | R60 | 1 | RES,MET FLM,1/4W,1%,10K | 810229-103 | |
| 6-9 | R61 | 1 | RES,MET FLM,1/4W,1%,100K | 810229-104 | |
| 6-9 | R62 | 1 | RES,MET FLM,1/4W,1%,10K | 810229-103 | |
| 6-9 | R63 | 1 | RES,MET FLM,1/4W,1%,100K | 810229-104 | |
| 6-9 | R64,R65 | 2 | CFR,1/4W,5%,220 | 810125-221 | |
| 6-9 | R66 | 1 | RES,MET FLM,1/4W,1%,10K | 810229-103 | |
| 6-9 | R67 | 1 | RES,MET FLM,1/4W,1%,100K | 810229-104 | |
| 6-9 | R68-R70 | 3 | RES,MET FLM,1/4W,1%,10K | 810229-103 | |
| 6-9 | R71-R74 | 4 | RES,POT,10K,1/4W,15 TURN | 810326103Y | |
| 6-9 | RA5,RA6 | 2 | RES,SIP,.2W,2%,47K,10 BUS | 810900-473 | |
| 6-9 | RA7 | 1 | RES,SIP,.2W,2%,100K,10 BUS | 810994104L | |
| Transistors | | | | | |
| 6-9 | Q10 | 1 | XSTR,VP0206N3,P-CHA,FET | 814001 | |
| 6-9 | Q12-Q14 | 3 | XSTR,VP0206N3,P-CHA,FET | 814001 | |
| Diodes | | | | | |
| 6-9 | D1-D4 | 4 | DIO,SILICONE SWITCHING 75V | 813500 | |
| 6-9 | D5,D6 | 2 | DIO,RECT 1N4001 50V | 813200 | |
| 6-9 | D7,D8 | 2 | DIO,MBR120P SCHOTTKY BARR RECT | 813503 | |
| 6-9 | D9 | 1 | DIO,SILICONE SWITCHING 75V | 813500 | |
| 6-9 | D10,D11 | 2 | DIO,1N5711 SCHOTTKY | 813019 | |
| 6-9 | D12-D15 | 4 | DIO,SILICONE SWITCHING 75V | 813500 | |
| 6-9 | D16 | 1 | DIO,1N5711 SCHOTTKY | 813019 | |
| 6-9 | D17,D18 | 2 | DIO,SILICONE SWITCHING 75V | 813500 | |
| 6-9 | D19 | 1 | DIO,1N5711 SCHOTTKY | 813019 | |
| Connectors | | | | | |
| 6-9 | J1 | 1 | CONN,0.1" SPACED CRP-TO-W | 851045 | |
| 6-9 | J2 | 1 | CONN,HDR/RCPT 0.1" SPACED | 851067 | |
| 6-9 | J3 | 1 | CONN,UNSRHD HDR 0.1: CTR LINE | 851008 | |
| 6-9 | J4,J5 | 2 | CONN,RT ANGLE HDR, 6CKT, GOLD | 851007 | |
| 6-9 | J6 | 1 | CONN,4WL HDR,PC MT,34CKT 0.1 X 0.1 | 851079 | |
| 6-9 | J7,J8 | 2 | CONN,0.1" SPACED CRP-TO-W | 851047 | |
| 6-9 | J9,J10 | 2 | CONN,0.1" SPACED CRP-TO-W | 851044 | |
| Miscellaneous | | | | | |
| 6-9 | TP1-3 | 3 | TST PT,YEL,.063 DIA | 815064 | |
| 6-9 | TP5 | 1 | TST PT,YEL,.063 DIA | 815064 | |
| 6-9 | TP7 | 1 | TST PT,YEL,.063 DIA | 815064 | |
| 6-9 | Y1 | 1 | XTAL MIPRCS AT CUT 10 MHZ | 815043 | |

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Table 6-9. Parts List - Motor Controller Board CCA

| Fig No | Ref Desig | Qty | Description | Part Number | Reference |
|--------|-----------|-----|------------------------------------|-------------|-----------|
| 6-9 | L1,2 | 2 | INDUCTOR,1 MH TOROID | 40-3006-7 | |
| 6-9 | XU16 | 1 | CONN,SKT,52 PIN PLCC | 856084 | |
| 6-9 | XU19 | 1 | SKT LOW PF DIP OPEN FR 28 PIN | 815002-3 | |
| | Ref | | Schematic, PC-2TX Motor Controller | 20-5050-1 | |

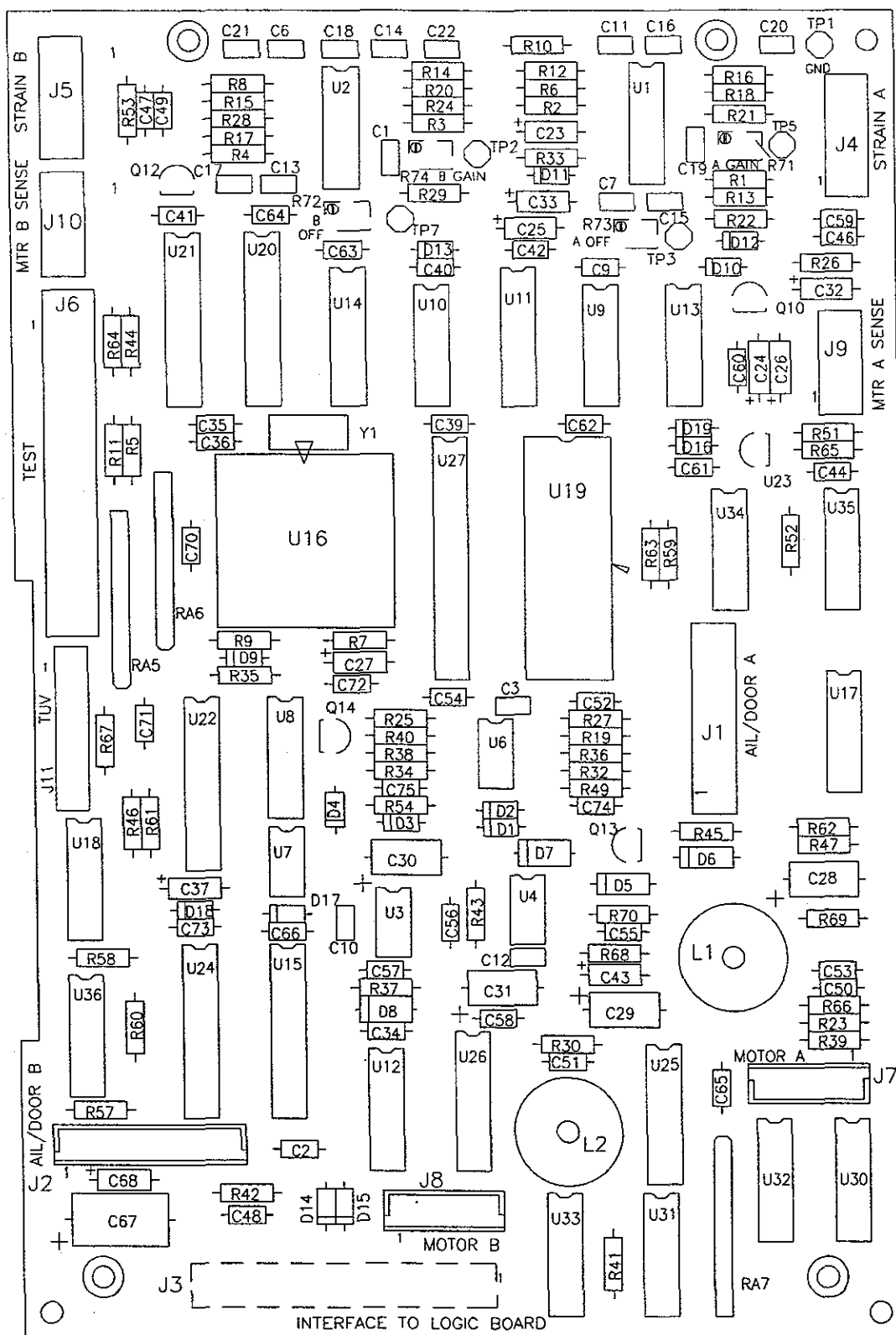


Figure 6-9. Parts Identification - Motor Controller CCA

SECTION 7 - CALIBRATION AND PREVENTATIVE MAINTENANCE

7.1 INTRODUCTION

This section contains calibration and preventive maintenance instructions and a comprehensive operational performance test for the IMED® GEMINI PC-2TX® Volumetric Pump/Controller ("PC-2TX").

WARNING

Potentially lethal voltages are present within the PC-2TX case when the instrument is operated using external AC power. When the case is opened for maintenance action, it is recommended the instrument be operated using the internal battery.

CAUTION

Printed circuit boards (PCBs) are easily damaged when integrated circuits are removed and replaced. Excessive heat applied to the circuit board traces and pads can cause de-lamination of the metal foil and base material. Damage of that type is essentially irreparable; therefore, only low-temperature soldering irons and vacuum solder removal tools should be used when removing and replacing components on PCBs. Leads on integrated circuit components should be cut before attempting un-soldering and removal.

NOTE

CMOS devices are sensitive to static electrical charges and may be damaged during repair if the repair activity is not performed in an ESD protected environment using approved ESD protective procedures including personnel grounding.

7.2 PREVENTIVE MAINTENANCE

The PC-2TX is designed and assembled with the goal of minimizing maintenance requirements. The integral microprocessor incorporates a diagnostic routine that

monitors the instrument's subsystems and operating parameters. Detection of operating system irregularities or failures that affect the instrument's functional operation activates audio and visual Alarms or Malfunction alerts for operator notification. Problems of this nature are recorded in the non-volatile RAM error log for subsequent use by biotechnical personnel in performing troubleshooting and repair actions.

Maintenance-free operation between regularly scheduled preventive maintenance inspections can be enhanced by performing routine cleaning on an 'as required' basis per Section 5.2.1. The recommended interval for preventive maintenance inspections is once a year based on normal use and operation. Verification of proper operation is the responsibility of the user. At the user's option, such tests and verification may be performed at the factory at nominal cost. The following paragraphs describe in detail the procedures for performing general maintenance on the PC-2TX.

7.3 CALIBRATION PROCEDURES

7.3.1 Strain Beam Calibration

Any time a Strain Beam (pressure transducer) assembly has been removed from the front case assembly or replaced, the appropriate Motor Controller PC Board is changed or a component in the strain beam circuitry (see figure 4-10) is replaced; the following calibration/adjustment procedure **MUST** be performed prior to returning the instrument to patient care service.

7.3.1.1 Calibration Equipment Requirements

NOTE

Calibrated tubing must be obtained from the ALARIS Medical Systems San Diego Corporate Office.
(ALARIS Medical P/N 3299-100)

1. Calibrated tubing with specified LOW and HIGH Reference Voltage constants between 1.0 and 2.0.

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2. Digital Voltmeter with 1 millivolt resolution.
3. Digital Pressure Gauge, 0-30 psi range and 0.1 psi resolution on a Mercury (Hg) manometer.
4. Stopwatch.
5. Regulated, stable air source adjustable to 10 ± 0.1 psi.

WARNING

The following calibration procedure is performed with the instrument case open. The preferred procedure is to perform the calibration using a fully charged battery. If AC power is used, potentially lethal voltages are present in the rear case assembly. Use caution when connecting meter leads to the Motor Controller PC Board.

7.3.1.2 Calibration Procedures

1. Separate the case (see Section 5.5.1).
2. If the batteries are not fully charged, connect the AC power cord.
3. Initialize the instrument in the Maintenance Mode (see Section 5.3.1 for procedure).
4. Press **2** to select "MC board tests and displays".
5. Press **2** to select "strain beam voltages".
6. Attach the DVM black lead (-) to TP1 and the red lead (+) to TP3 on the appropriate Motor Controller board.
7. Press **A** to select channel A.
8. Open the channel A door.
9. Verify the #4 (4th from the top) pumping finger is fully extended.
10. Install the calibrated disposable into the channel A pump chamber and close the door. Write down tubing constant # from the installed calibrated disposable.

CAUTION

The front case must be in the upright position when this calibration procedure is performed. DO NOT put any pressure on the pumping chamber door during the calibration process.

11. Wait 20 seconds, then adjust the channel A offset potentiometer R73 on the Motor Controller board to obtain a reading of 0 ± 0.01 volts on the DVM.
12. Apply and maintain 10.0 ± 0.1 psi to the distal end of the calibrated disposable (allow 15 seconds for the system to stabilize).
13. Move DVM red lead to TP5. Read the channel A voltage on the PC-2TX's Central Information Display, adjust the channel A gain potentiometer R71 to obtain a reading of 2.50 ± 0.01 volts.
14. Readjust the channel A offset potentiometer R73 until the Central Display reads $[2.50 + (\text{tubing constant} \pm 0.05)]$ volts.
15. Shut off and remove the pressure source from the distal end of the calibrated disposable.
16. Wait 25 seconds, then read the voltage on the Central Display. The reading should equal the tubing constant voltage ± 0.3 volts. If the displayed voltage value is not within the stated tolerance, repeat steps 10 through 15 above.
17. Open and close the door leaving the disposable in place, wait 20 seconds then read the Central Information Display voltage again. The reading should be the disposable constant ± 0.3 volts.
18. Open the door and remove the disposable.

NOTE

Do not use a sharp object or fingernail to push on the bezel seal.

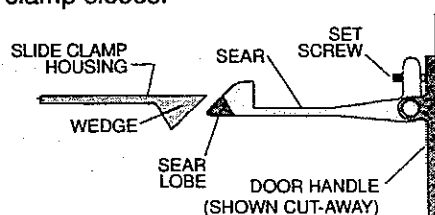
19. With the channel A door open, use a knuckle or pencil eraser to gently press on the strain beam finger. Check the DVM reading is 5.05 ± 0.1 volts.
20. With the door still open, record the voltage on the DVM; if > -0.075 volts, recalibrate the channel with a new calibrated disposable. If second calibration produces an out of specification reading, replace the strain beam.

NOTE

To calibrate channel B, connect the DVM red (+) lead to TP7, use R72 for OFFSET adjustments and TP2 use R74 for GAIN adjustments.

7.3.2 Door Sear Adjustment

Anytime a pumping chamber access door, any of the door components or the air-in-line assembly are replaced, the slide clamp sear must be re-rigged. Refer to the following figure: use the set screw on the sear to raise or lower the sear lobe as necessary to align the top of the sear lobe with the top of the slide clamp wedge (as shown). After adjusting the sear, install a Gemini set, close and open the door to verify the slide clamp closes.



7.4 COMPREHENSIVE OPERATIONAL PERFORMANCE TEST

The comprehensive operational performance test should be performed on any PC-2TX that has been removed from service for repair or has been subjected to servicing that required the case to be opened. In the event an instrument should fail to meet specified test performance criteria, it will be necessary to troubleshoot specific areas of deficiency and perform the repairs needed to restore full operational capability prior to returning the instrument to service.

7.4.1 Electrical Inspection

CAUTION

Some of these tests are inherently hazardous. Safeguards for personnel and property should be employed when conducting such tests. Tests should only be performed by qualified personnel.

7.4.1.1 Electrical Leakage Test

Perform an electrical leakage current measurement in compliance with Underwriters Laboratories (UL) 544 for *Patient Care Equipment* or Canadian Standards Association (CSA) Standard C22.2 No. 125 for *Risk Class 2G Equipment* or IEC 601-1. Leakage currents are to be less than 100 microamperes.

7.4.1.2 Electrical Ground Test

Perform an electrical ground impedance measurement in compliance with UL 544 for *Patient Care Equipment* or CSA Standard C22.2 No. 125 for *Risk Class 2G Equipment* or IEC 601-1. The impedance between the grounding pin on the power cord plug and the grounding point on the rear case should not exceed 100 milliohms.

7.4.1.3 Dielectric Test (Optional)

Perform a dielectric withstand test in compliance with UL 544 for *Patient Care Equipment* and/or CSA Standard C22.2 No. 125 for *Risk Class 2G Equipment*. Leakage current to be <1mA at 1500 volts.

7.4.1.4 Battery Runtime Test

Sealed lead-acid batteries lose capacity over time, dependent on usage patterns such as frequency and depth of discharge. Since rate of loss increases as capacity diminishes, ALARIS Medical Systems recommends replacement of batteries if the run-time for one channel operation at 125 mL/hr is <3.5 hours. To check run-time: Ensure that instrument is fully charged by connecting to AC power for a minimum of 16 hours. Disconnect pump from AC. Power pump on and verify that battery icon flashes on the front panel. Set up a primary infusion, set the rate to 125 mL/hr and VTBI to 9999 mL and start the instrument. When the instrument system voltage falls below 5.8 VDC, a "Low Battery" message will flash in the Central Information Display (CID) accompanied by a short beep every 2 seconds. At 5.4 VDC the pump will pause all channels, display a "Battery Discharged" screen in the CID, and emit a constant alarm audio. This indicates a Low Battery-2 condition and constitutes completion of the run-time test.

Charge battery at least 16 hours before returning to service.

NOTE

When the lead acid battery reaches end-of-life, it is common for the battery to develop an internal short. This will cause the charging circuit of the pump to run continually when the pump is connected to AC power. Continual charging will result in the transformer generating heat, causing the pump's rear case to be hot to the touch. PC-2TX pumps that exhibit a hot rear case should be removed from use and further evaluated.

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7.4.2 Qualitative Operational Performance Test

The abbreviated qualitative operational performance test will check the PC-2TX's keypad, audio control, displays and indicators; instrument operation in the Pump and Controller modes including those audio and visual alerts associated with normal instrument operation and the instrument power down sequence. Perform the abbreviated qualitative operational performance test in accordance with the procedures described in Section 2.3.3.2.

7.4.3 Quantitative Operational Performance Test

The following operational performance tests are designed to ensure the PC-2TX is functioning in accordance with design specifications. Test procedures are provided to evaluate specific areas of instrument performance.

7.4.3.1 Equipment Requirements

1. Universal test station: (see Figure 7-1).
 - Selector valve manifold
 - 10 mL Volumetric burette
 - Digital Pressure gauge 0-60 psig accurate within 2.0% or better
 - 36" (1 m) view tube (macro bore tubing on yard stick).
2. Air in line simulator (see Figure 7-2)
3. Stopwatch with minimum resolution of 1 second.
4. Vented bottle or bag of Normal Saline.
5. GEMINI Non-vented administration set(s) with 2 injection sites.
6. Waste fluid catch basin.
7. Test Data Sheet (see Figure 7-3).

7.4.3.2 Test Procedures

The following test procedures are presented in a sequence that will allow the required test protocols to be accomplished accurately and in an expeditious and efficient manner. **Tests are identical for all channels; upon completion of channel A testing, repeat for channel B.**

TEST SETUP

1. Spike a vented bottle or bag of Normal Saline or tap water with a GEMINI Non-vented administration set and hang on the IV solution test stand. Check to ensure the roller clamp is closed.

2. Connect the distal end of the tubing set to the input side of the stopcock manifold.
3. Set the stopcocks to allow fluid to pass through the manifold to the fluid catch basin.
4. Flood the drip chamber, open the roller clamp, prime the set then close the second stopcock.
5. Adjust the height of the solution container to provide a measured head height of 24" (61 cm) i.e., 24" (61 cm) of vertical displacement between the strain beam and the fluid level in the container.
6. Install the tubing set in channel A of the PC-2TX; close and latch the access door.
7. Ensure the tubing segment between the stopcock manifold and the pressure gauge is primed.
8. Press **POWER ON**, then press **A** to select channel A.
9. Select CONTROLLER mode, set RATE to 125 mL/hr and set VTBI to 100 mL.

LOW-FLOW HEIGHT TEST

1. Turn stopcock #3 to direct the pump output to 36" (1 m) view tube only. Ensure the 18" (0.5 m) mark on the view tube is level with the fluid in the solution container.
2. Press START and observe:
 - Fluid column rises in the view tube
 - Pumping mechanism stops
 - Audio Advisory sounds
 - "LOW FLOW" advisory scrolls for 1 minute
 - After 1 minute audio alert changes to Alarm and "OCCLUDED" scrolls continuously.
3. Record the height of the fluid column in the view tube on the data sheet (reading must be between 6 and 30 inches or 19.5 and 80.5 cm).
4. Press **SILENCE** to silence the audio, then press **A** followed by **PAUSE**.
5. Turn stopcock #3 to drain the fluid column to waste; drain to the 0 graduation, then turn the stopcock to the bypass position.

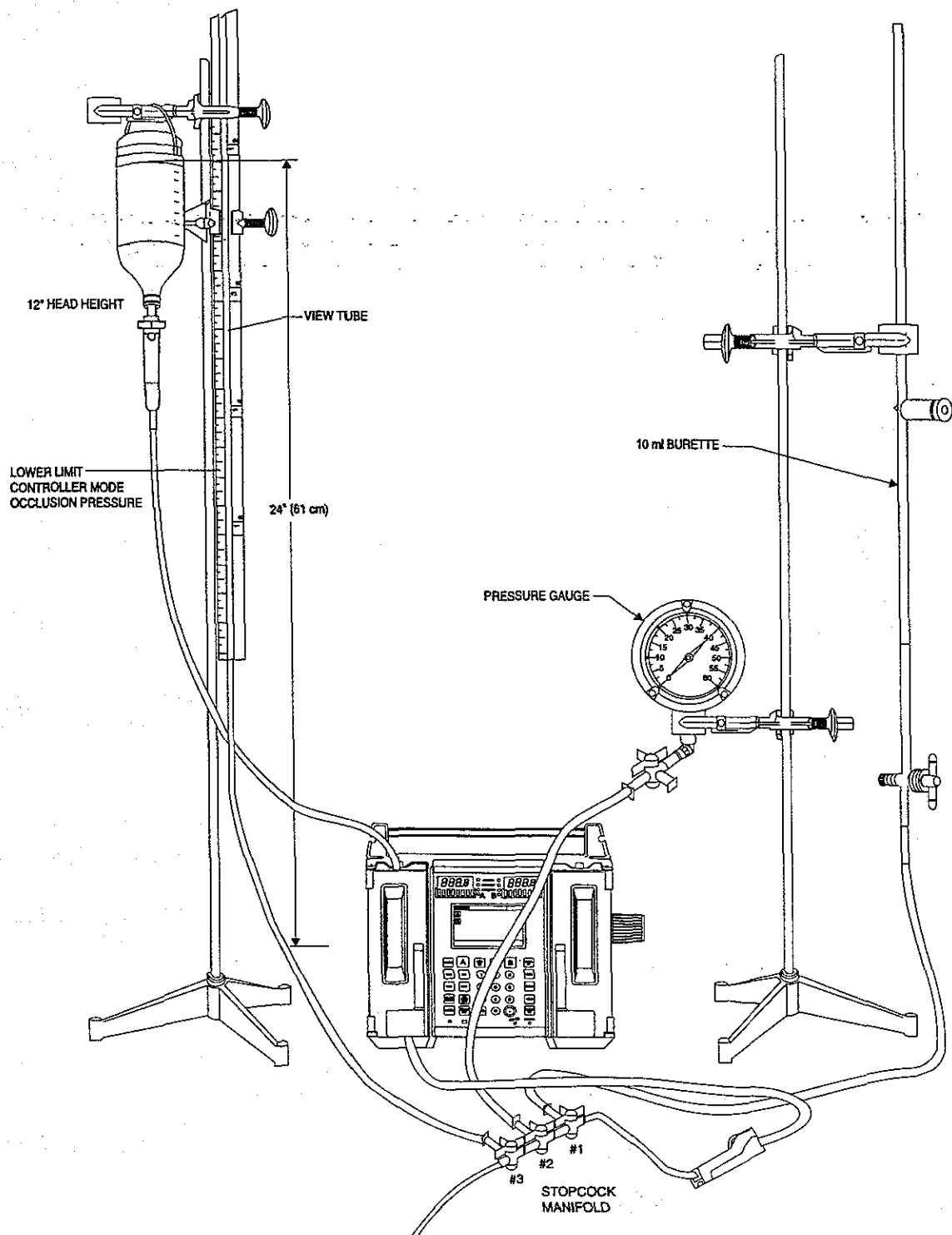


Figure 7-1. Universal Test Station Setup

OUTPUT PRESSURE TEST

1. Turn stopcock #2 to direct pump output to the pressure gauge.
2. Select PUMP mode.
3. Press **START** and observe:
 - Pumping mechanism stops
 - Audio Alarm sounds
 - ALARM indicator - flashes
 - "OCCLUDED-PATIENT SIDE" scrolls continuously.
 - Central Information displays shows ALARM for channel A.
4. Record pressure gauge reading on the data sheet immediately following alarm (reading must be between 8 and 12 psi or 55.2 and 82.8 kPa).
5. Press **SILENCE** to silence the audio, then press **A** followed by **PAUSE**.
6. Turn stopcock #2 to the bypass position momentarily to relieve the pressure and then turn back to the pressure gauge position.

VOLUME/RATE/TIME TEST

1. Home channel A by opening pumping chamber access door.
2. Turn stopcock #1 to direct fluid flow to the 10mL burette.
3. Press **START** to fill the burette to the 10mL line, then press **A** and **PAUSE**.
4. Press **VOLUME INFUSED** followed by **CLEAR** to reset the Volume Infused registers to "0".
5. Set VTBI to 5mL and verify the RATE is set to 125 mL.
6. Press **START** and start the stopwatch simultaneously.
7. When audio Advisory sounds and "INFUSION COMPLETE-KVO" scrolls, immediately stop the stopwatch and press **A** followed by **PAUSE**.

CAUTION

Failure to stop the pump immediately will induce a volume accuracy error into the test.

8. Read the fluid level in the burette.
9. Record the volume delivered (10 mL minus fluid level from step #7) and elapsed time on the data sheet. (Volume delivered must be between 4.75 and 5.25 mL and elapsed time must be within 2:17 and 2:31 (min:sec) limits).
10. Turn stopcock #1 to drain the fluid in the burette down to the 10mL line.

AIR IN LINE TEST

1. Open the channel A access door and remove the administration set.
2. Install the pumping segment of the AIL simulator (see Figure 7-2) into the channel A pumping mechanism, then press the tubing into the AIL detector.
3. Push the slide clamp in (the instrument will auto power on in Alarm mode).
4. Use the AIL simulator plunger to raise the fluid level to the top of the slide clamp fitment.
5. Close the door.
6. Select the channel to be tested, set the rate to 125 mL/hr and VTBI to 50 mL and press **START**.
7. Use the AIL simulator plunger to draw the fluid level below the AIL detector.
8. Verify that within 2 seconds the PC-2TX goes into AIL alarm:
 - Pumping stops
 - Operating LED indicator stops flashing
 - Alarm audio sounds
 - Alarm LED flashes
 - Channel Information display scrolls "AIR IN LINE"
 - Central Information display shows "ALARM" for appropriate channel.
9. Select the test channel and press **CHANNEL OFF** to power down or **PAUSE** to set up the channel for test.

MAXIMUM PRESSURE TEST

1. Initialize instrument in the Maintenance Mode.
2. Press **2** to select M/C Board Tests and Displays.
3. Press **1** to select maximum pressure test.
4. Press **A** to select channel A.
5. Press START control and allow the pump to operate for at least 30 seconds and wait until the peak pressure stabilizes.
6. Record the highest pressure reading obtained.
Resultant pressure must be ≥ 17 psi.
7. Press **CANCEL** twice to return to the Maintenance Mode screen.
8. Turn stopcock #1 to the bypass position momentarily to relieve the pressure.
9. Press **3** then **CHANNEL OFF** to power down the instrument.

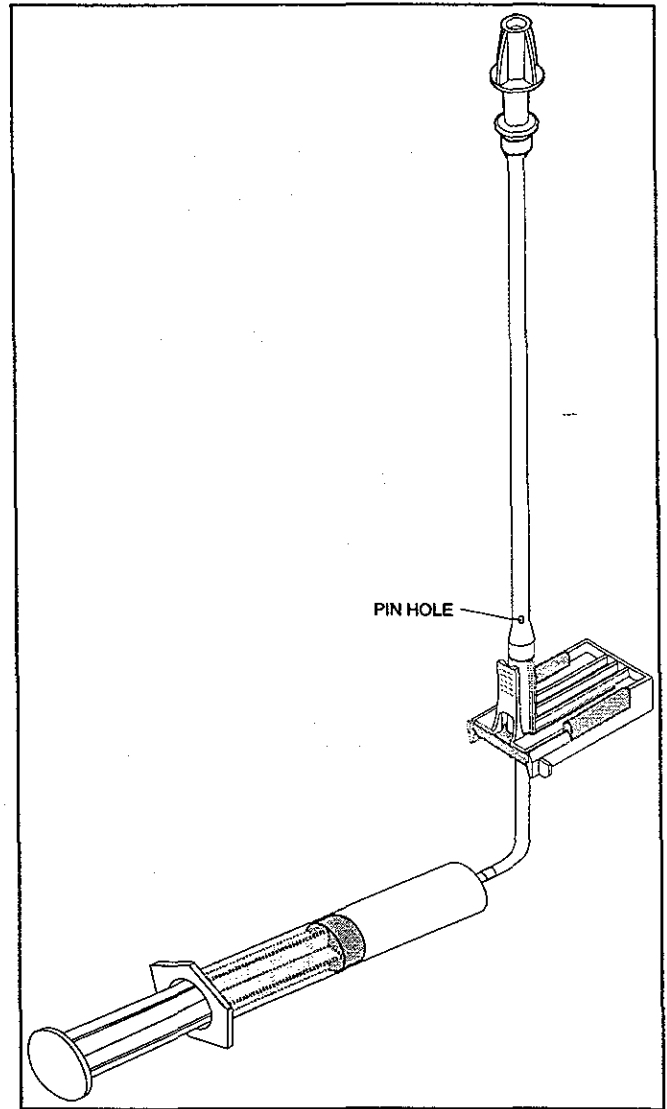


Figure 7-2. Air-in-line Simulator

PC-2TX

PC-2TX TEST DATA SHEET

Instrument Serial No. _____ Software Version _____

Date _____ Technician _____

| Test No. | Description | Reference | Pass/Fail |
|----------|-------------------------|-----------|--|
| 1 | Electrical Leakage Test | 7.4.1.1 | ___/___ |
| 2 | Electrical Ground Test | 7.4.1.2 | ___/___ |
| 3 | Initialization | 2.3.2.2 | ___/___ |
| 4 | Pump Mode Operation | 2.3.3.2 | Ch A ___/___ Ch B ___/___ |
| 5 | LOW-FLOW HEIGHT TEST | 7.4.3.2 | Fluid Height Ch A ___/___ Ch B ___/___ |
| 6 | OUTPUT PRESSURE TEST | 7.4.3.2 | Pressure Ch A ___/___ Ch B ___/___ |
| 7 | MAXIMUM PRESSURE TEST | 7.4.3.2 | Pressure Ch A ___/___ Ch B ___/___ |
| 8 | VOLUME/RATE/TIME TEST | 7.4.3.2 | Volume Ch A ___/___ Ch B ___/___ Time Ch A ___/___ Ch B ___/___ |
| 9 | AIR-IN-LINE TEST | 7.4.3.2 | Ch A ___/___ Ch B ___/___ |
| 10 | Battery Runtime Test | 7.4.1.4 | ___/___ |

PC-2TX OPTIONAL TESTS

These tests are to be performed at the discretion of the repairing facility

| | | | |
|---|----------------------------|---------|-----------------|
| 1 | Dielectric Test | 7.4.1.3 | Pass___/Fail___ |
| 2 | Maintenance Mode Test | 5.3 | Pass___/Fail___ |
| 3 | ECD Test (when applicable) | 3.3.1.3 | Pass___/Fail___ |

Figure 7-3. PC-2TX Test Data Sheet

WARRANTY

ALARIS Medical Systems™, Inc. (hereinafter referred to as "ALARIS Medical") warrants that:

- a. Each new IMED® GEMINI PC-2TX® volumetric Infusion Pump/Controller, excluding the battery, is free from defects in material and workmanship under normal use and service for a period of one (1) year from the date of delivery by ALARIS Medical to the original purchaser.
- b. The battery and each new accessory are free from defects in material and workmanship under normal use and service for a period of ninety (90) days from the date of delivery by ALARIS Medical to the original purchaser.

If any product requires service during the applicable warranty period, the purchaser should communicate directly with ALARIS Medical headquarters (San Diego, CA) to determine the appropriate repair facility. Except as provided otherwise in this warranty, repair or replacement will be carried out at ALARIS Medical's expense. The product requiring service should be returned promptly, properly packaged and postage prepaid by purchaser. Loss or damage in return shipment to the repair facility shall be at purchaser's risk.

In no event shall ALARIS Medical be liable for any incidental, indirect or consequential damages in connection with the purchase or use of any ALARIS Medical product. This warranty shall apply solely to the original purchaser. This warranty shall not apply to any subsequent owner or holder of the product. Furthermore, this warranty shall not apply to, and ALARIS Medical shall not be responsible for, any loss or damage arising in connection with the purchase or use of any ALARIS Medical product which has been:

- (a) repaired by anyone other than an authorized ALARIS Medical service representative;
 - (b) altered in any way so as to affect, in ALARIS Medical's judgement, the product's stability or reliability;
 - (c) subjected to misuse or negligence or accident, or which has had the product's serial or lot number altered, effaced or removed;
- or
- (d) improperly maintained or used in any manner other than in accordance with the written instructions furnished by ALARIS Medical.

This warranty is in lieu of all other warranties, express or implied, and of all other obligations or liabilities of ALARIS Medical, and ALARIS Medical does not give or grant, directly or indirectly, the authority to any representative or other person to assume on behalf of ALARIS Medical any other liability in connection with the sale or use of ALARIS Medical products.

ALARIS MEDICAL DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OR MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE OR APPLICATION.

See packing inserts for international warranty, if applicable.

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